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UNEXPECTED CONSEQUENCES: THREE PAPERS ON HOW LAW CAN SHAPE BEHAVIOR

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ABSTRACT

This thesis is a collection of three articles—(i) *The Problem of Low Interest Rates in Civil Litigation in India,* (ii) *Missing Women: An Explanation*, and (iii) *NIMBYism and Fiscally Affordable Housing*.

The Problem of Low Interest Rates in Civil Litigation in India identifies a possible explanation for judicial delays in India. Ideally, a successful litigant should be compensated for the time-value of money (interest) for the period between the cause of action and the recovery of money. However, Indian laws award much lower interest to winning litigants, when compared to other common law countries. Interest rate awarded also depends on the nature of the dispute, rather than the cost of capital of the parties. Further, the jurisprudence developed on Indian statutory law has resulted in a system that inconsistently awards interest and favors awarding lower interest rates. One case involving a large Indian firm elucidates the incentives that are set up by the low interest rates awarded in judgments. In this case, the interest rate award by the Supreme Court of India was *lower* than the cost of capital of the firms. This paper suggests that this may be creating perverse incentives. Defendants have the incentive to drag out cases, even if they know that they will eventually lose the case.

Missing Women: An Explanation provides a novel explanation to the problem of female feticide (also known as son preference). By 2010, it was estimated that around 126 million women were missing through sex selective abortions. Multiple explanations have been provided for this observed son preference. However, these explanations do not fit the existing data or are tailored to individual cases. This paper provides the first *generalized explanation* for the problem of missing women—a type of land reforms called: *land to the tiller programs*.

Under these reforms, the government distributes agricultural land to farmers, but the government places various legal restrictions on transferring, using, or leasing such agricultural land. These legal restrictions imposed by the *land to the tiller* program create economic pressure to beget sons to maintain possession of land when the present owners are too old to farm the land personally. This paper reports cross country data showing a clear temporal link between *land to the tiller* reforms being implemented and sex-ratio-at-birth deteriorating. It also shows that similarly positioned countries that did not implement *land to the tiller* programs do not show son preference through sex-selective abortions.

NIMBYism and Fiscally Affordable Housing attempts to explain the rising costs of homes in the U.S. There is developing consensus that the rise in home prices is being driven by NIMBYism which results in exclusionary zoning laws. However, the existing literature on this type of NIMBYism is fragmented, with multiple explanations for the phenomenon. The paper provides a novel explanation as to why cities engage in NIMBYism: a combination of the interests of the citizens and the city government's incentives driven by public choice. This novel explanation is supported by a detailed analysis of the public finance of the U.S.'s largest cities over a 39-year period. The model proposed in the paper also explains another phenomenon—resistance to gentrification. The paper concludes by predicting that the current policy approaches to solving the affordable housing problem will not be successful because they ignore the interests of the city governments and call for novel solutions that are cognizant of the challenges explained by the model.

These three papers seem to be disconnected. However, a common thread connects all the three papers—*the unexpected consequences of laws*. This dissertation explores how laws can shape incentives in unexpected ways: reducing interest rate in litigation may lead to burdening the judiciary with time-consuming cases; land reforms may lead to female feticide; and governments depending on property taxes may make homes unaffordable. There may be many other social phenomena that are a result of legal changes in unrelated fields. There is a significant body of literature on the *unintended consequence of laws.* This literature usually identifies phenomenon close to the area in which the law operates. However, this dissertation tries to show that the effects of legal change may happen in unrelated fields and may have significant implications.

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This dissertation would not have been possible without the help of the administration of the Law School and the Library. Dean Badger, and Director Swinsick ensured that I was able to concentrate on my research without any distractions. Similarly, this dissertation owes its existence to the support provided by the Ephraim Fellowship that funded the research on U.S. housing. The paper on sex-selective abortions would not have been possible without the collection at the Regenstein Library and the support from librarians at the Law School and the Regenstein Library.

On the personal front, this research owes its existence to the support of my wife Modhura, for the entire duration of my work at UChicago. Her support was invaluable especially during the lockdowns and restrictions imposed during COVID-19.

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THE PROBLEM OF LOW INTEREST RATES IN CIVIL LITIGATION IN INDIA[*]

Any judicial adjudication takes time. When claims are finally settled, the successful party has to be compensated for the time. Otherwise, the party is not put in the same position as if the legal harm had not been done. This requires a successful party recovering interest on the monetary claim.

How much interest is the successful party entitled to? The law and the courts must answer this question. There are four possible ways of doing this. (i) Leave it to the discretion of the courts; (ii) calculate the capital cost of the parties; (iii) enforce a rate agreed to between the parties; or (iv) fix a reference rate in the statute. Each method has its advantages and disadvantages. While the discretion of the courts and statutory rates are easier to implement, they do not reflect the cost of delayed payment to the successful plaintiff. This is done when the court awards the opportunity cost of money to the successful party. However, this method is difficult and prone to variation. It may not be feasible to calculate the opportunity cost of a party accurately.

India follows a mixed approach to determine the interest rate in judgments. In some cases, it specifies the rates and leaves it to the discretion of courts in others. The treatment varies depending on whether the case is a general suit or is governed by specialized legislation. Due to

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[*] This paper is co-authored with Karan Gulati, Research Fellow, TrustBridge Rule of Law Foundation.

multiple laws at different times, India has a complicated legislative framework for calculating interest rates. Compounding this problem has been the judicial approach. Jurisprudence on this complicated legal framework is divergent and devoid of underlying economic philosophy. Poor legislative drafting has been interpreted in ways that lead to unpredictable results.

The rate for most civil disputes in India was last amended in 1976. Since then, the economic conditions of India have changed. This has resulted in a scenario where interest awarded by courts have become less and less in line with the market rates. Overall, both the legislative framework and its judicial interpretation have favored *lower* interest rates over reasonable capital cost. This consistent practice of awarding lower interest rates has economic consequences. It generates perverse incentives for litigants. Since the legislation was last amended, the risk-free rate of return doubled and then went down again. However, the courts continue to award substantially lower interest rates. If the interest rate awarded by the courts is lower than the borrowing cost for the losing defendant, it can create an incentive to drag out litigation. Every year that a losing defendant can delay the eventual judgment, she makes a notional profit. This profit is the difference between the rate at which the party can borrow from the market and the rate awarded by the court at the end of the litigation. If she can sufficiently delay the litigation, the defendant may recover the entire principal due to the plaintiff.

The problem of awarding low interest rates is further compounded by the uncertainty in the rate that the court will finally award. Indian jurisprudence shows no predictability in whether interest will be awarded, at what rate it will be awarded, and for what period. Courts frequently change the statutory provision through interpretation and even overrule interest rates agreed to by the parties. This causes uncertainty in contracts. Parties cannot foresee the damages that will be

awarded if the contract's commitments are not honored. Such uncertainty leads to less contracting; contracting being limited between parties who trust each other, or excessive capital being locked up in guarantees.

This has policy consequences. India's slow judiciary and poor record in contract enforcement have recently gained prominence. However, most solutions offered for the problem revolve around increasing the size and capacity of the judiciary. We think that perverse incentives caused by awarding low interest rates and lack of certainty about interest being awarded may contribute to the delay. If this is the case, then increasing the number of judges will not solve the problem. India needs substantial legal changes in awarding interest to successful parties in litigation. Such rates should reflect the economic reality of India and consider the borrowing cost for average litigants. They should also consider the opportunity cost of money for successful litigants. The law should be a general principle and not be dependent on the nature of the litigation.

This paper contributes to the literature on analyzing *perverse incentives* and *unintended consequences* created by law.[1] Our findings are similar to "Political equality and unintended consequences", which shows that laws may have unintended consequences.[2] Starting from Welch, who argued that minimum wage legislation had the opposite effect of reducing income,

[1] Norton, "Unintended Consequences."
[2] Sunstein, "Political Equality and Unintended Consequences."

there is growing literature showing that legislation has consequences unforeseen by the creators, including precisely the opposite outcome.[3] This paper argues that in addition to the perverse incentive to extend litigation, interest laws in India may be contributing to the problem of judicial delays. In Regy and Roy's lines, judicial delays in India may be a product of incentives rather than a shortage of judges.[4]

The rest of this paper is organized as follows: the first section describes the reasons and methods of awarding interest to a successful plaintiff found in theory. Then the paper highlights the international experience of awarding interest. After the international experience, the paper discusses the legislative and judicial approaches to awarding interest in India. The paper then highlights how the legislation, coupled with innovative judicial interpretation, has resulted in parties forming incentives to delay litigation. These incentives are shown to play out in the case of Vedanta *Ltd v Shenzhen Shandong Nuclear Power Construction Co Ltd* as a case study to show how such incentives might be formed. The paper then suggests a method of aligning parties' incentives and achieving a sound law on awarding interest.

[3] Welch, "Minimum Wages. Issues and Evidence."
[4] Regy and Roy, "Understanding Judicial Delays in Debt Tribunals."

Interest rates in litigation: Common law approach

Most Civil litigation (like torts, contracts, rents, etc.) involves plaintiffs demanding compensation in the form of money from the defendant. The objective of litigation (if the plaintiff is successful) is *restituto ad integrum, i.e.* to restore the plaintiff to a position where the harm caused by the defendant had not been done. This principle has been recognized in Indian law.[5] If the plaintiff succeeds but only recovers the amount originally due, she would be at a loss. For effective compensation, the plaintiff must be compensated for the loss due to the delay. The following illustration helps in understanding the role of interest in litigation:

On 1st January 2016, the defendant (D) broke the plaintiff's (P) glasses. The value of the glasses was ₹ 1000. P sued D on the same day. The court took three years to decide the case and gave its judgment on 1st January 2019. The judgment was in favor of P.

After ruling in favor of P, one of the questions before the court is how much should D pay P? The law's objective is to restore P to a situation, as close as possible, had D not broken the glasses. Justice demands that a person who deprived of money to which she is legitimately entitled ought to be compensated for such deprivation - paying ₹ 1000 is not enough. If D had paid P on the first day, i.e., 1st January 2016, ₹ 1000 would have been satisfactory. However,

[5] Destruction of Public and Private Properties v State of A.P. and Ors., 5 (2009) SCC.

three years later, P has to be compensated for the time value of being denied ₹ 1000. Otherwise, she is not put in the same position as if the harm had not been done. This requires that P recovers interest on the monetary claim.

How much interest is P entitled to? The law and the courts must answer this question. This can be done in multiple ways. Determining the method of awarding interest requires an analysis of each's pros and cons. Legal systems use one of the following four methods to award interest to successful plaintiffs: (i) *Judicial discretion*; (ii) *capital cost* of the defendant or plaintiff, also called the opportunity cost or force loan rule; (iii) *pre-agreed rate* between the litigants; and (iv) *reference rate,* usually set by statute.

Judicial discretion: It leaves the interest rate to the judge's discretion. The judge may also refuse to grant interest depending on the course of litigation. Indian courts usually grant 6% simple interest when given the discretion to do so. If this rule were applied, P would be entitled to ₹ 180 for the three-year delay in recovering the cost of her glasses.

Capital cost: This rule states that the interest should be based on the opportunity cost of the money. Since opportunity cost depends on the person, there are three ways to calculate it: (i) Defendant's cost, (ii) Plaintiff's cost, or (iii) general cost.

The defendant's borrowing cost/ forced loan rule creates a legal analogy. It states that the day D broke P's glasses, in effect, P made an unsecured loan to D for the value of the glasses (₹ 1000). Now, after three years, D is repaying P. So, D should pay P the same rate as D would have been charged if she had taken an unsecured loan from the credit market. This ensures that D does not

gain from delaying the litigation.[6] It also compensates P for the delay. The second approach is the plaintiff's borrowing cost. It creates a similar legal analogy but considers P's borrowing cost. It states that, in effect, P had to borrow (or forgo using) ₹ 1000 for the three years. Therefore, the cost of P taking out an unsecured loan for three years should be the interest D has to pay.

While these two rules would create similar results if P and D were similarly situated, this is not always the case. If D is a large corporation, its borrowing cost is likely to be low. If P is a poor individual with no assets, the borrowing cost for P would be high. Using the first rule in such a case would be unfair to P as she would lose money for the three years. On the other hand, if the tables were turned and P was richer, D would benefit from breaking the glasses under the second rule. D would pay a lower interest rate compared to her capital cost. Assuming that P is an individual, India's prevailing interest rate for unsecured personal loans is about 18%. For credit cards, it is around 26% annually. The best rate for unsecured loans to large corporations is around 9%. Commercial loans will usually be on a compound interest basis. This would generate interest payouts of ₹ 643 (18%), 1000 (26%), or 295 (9%).

The above two rules require determining the capital cost for the defendant or plaintiff. This is not always feasible. Sometimes, the defendant or plaintiff may be ineligible for loans, the credit

[6] Patell, Weil, and Wolfson, "Accumulating Damages in Litigation. The Roles of Uncertainty and Interest Rates"; Knoll, "Primer on Prejudgment Interest."

markets may be imperfect, or there may be no way to determine the borrowing costs. To avoid judgment calls of an economic nature, courts sometimes take an average capital cost in the economy. It is usually the rate of return on a diversified portfolio in the economy. In India, the broad-based index NIFTY 50 has an average rate of return of around 13%.[7] Courts may use this as an average rate for all litigation. In this case, it would provide an interest of ₹ 443. This saves the court time and effort. While the interest awarded will be lower in some cases, in others, it may be higher. On average, the court would produce fair results.[8]

All the rules above leave wide discretion to judges and are expensive to execute. Judicial discretion may lead to variance, based on which a judge determines a case. A large number of assumptions may be required to determine the capital cost of defendants or plaintiffs. Even calculating the capital cost for the economy leaves discretion about what should be used as a reference rate of return for the economy. While the broad-based index represents a diversified portfolio, it does not represent the capital cost of most individuals.

Pre-agreed rate: If the parties had pre-agreed on the interest rate they would pay in case of a dispute, it would solve the problem for courts. If P and D had an agreement before D broke P's glasses to cover for such an event, they could have agreed on an interest rate. This negotiated

[7] National Stock Exchange, "Return Profile of Indices, Market Data."
[8] Weil, Lentz, and Evans, *Litigation Services Handbook: The Role of the Financial Expert*.

rate would be ideal because it would be based on the parties' free will and information. This is common in commercial contracts, where parties can foresee such events. If P had given the glasses to D for repair, such a rate could be negotiated in the repair contract. In such cases, this rule is the best approach. However, in tort cases, where there is no agreement between the parties covering the event, this rule cannot be used. Assuming P and D had agreed to a 10% interest compounded annually, the court would uphold the contract and award ₹ 331 as interest. Agreements between parties are available in few situations. Even if there is a contract, the event which caused the parties may not have envisaged the damage.

Reference rate: A way to avoid complex calculations about the capital cost is to award interest based on a reference rate. In this system, the legislature *ex-ante* sets the interest rate for all litigation. The rate can be a fixed number or a floating rate.[9] For example, the legislature can say that the rate will be 6% or; 4% more than the interest rate charged by the central bank. Both these systems ignore the positions of the defendant and the plaintiff. However, between the two, a floating rate may be superior to a fixed rate. By this, D compensates P for the existing inflation and interest rate situation in the country. By making the floating rate linked to the central bank rate (which is published regularly), the legislature makes it easy for the parties and the court to calculate the interest.

[9] The floating rate usually depends on some rate published by a statutory authority.

The four rules above have their advantages and disadvantages. *Judicial discretion* allows the judge to consider the facts and circumstances of the case. However, it places too much discretion in the judge's hands and may lead to variance in similar cases. The capital cost rules are closest to the economic ideal of compensating the litigants. Nevertheless, they are expensive to determine and require a large number of assumptions to be made. This may lead to inconsistent judgments in similar cases. The rules still leave the question of whose capital cost (defendant's or plaintiff's) should be used. The general capital cost or reference rates are easy to implement. However, they ignore the facts of the case at hand. If the plaintiff is poor, these rules may not adequately compensate her.

After deciding the interest rate, the court also has to decide the time for which the interest has to be paid. Generally, the time between the event and the eventual payment can be divided into three parts: (i) *pre-litigation*, (ii) *during litigation*, or (iii) *post-litigation*.

In our illustration, P filed the case on the same day that D broke her glasses. However, in reality, people take time to file a case. It may be due to the time taken to get documents ready or negotiation between the parties. The court has to determine what interest rate should be given for this period. Similarly, after the trial court's determination in favor of P, D may not immediately pay the money. She may appeal the judgment or not cooperate. P may have to fight appeals or apply to a court for enforcement proceedings. This will further delay the payment/restitution to P and should be offset by interest. While the same interest rate can be applied for all three stages, for policy reasons, courts and legislatures sometimes assign different rates for the different stages.

International Experience

Interest laws in the United Kingdom and the United States vary from those in India. They usually follow a *fixed* or a *reference rate* model. The discretion of judges, if any, is restricted by the contract rates.

United Kingdom

In the United Kingdom, the interest rate in litigation is governed by several legislations. One legislation governs the pre-judgment interest.[10] And there is a separate law for post-judgment interest.[11] which decides the post-judgment interest rate. These are subject to the contract-rate, if any, agreed to by the parties. Thus, if the parties have agreed to an interest rate, courts in the UK do not have the discretion to deny it. However, if parties had not decided on any interest rate, the judge has discretion in setting the rate to be awarded, under § 35A of the Senior Courts Act. This discretion is limited by sub-clause five of the same section, which states that interest may be awarded by reference to the rate specified in § 17 of the Judgments Act. § 17 of the Judgments Act governs post-judgment interest. The U.K. government fixed the It fixes this interest at 8%.[12] This rate is not open to variation by the courts.

[10] U.K., Senior Courts Act, 1981.
[11] U.K., Judgments Act, 1838.
[12] U.K., The Judgment Debts (Rate of Interest) Order, 1993.

However, these Acts do not apply in cases involving commercial debts. In that case, interest is awarded as per the Late Payment of Commercial Debts (Interest) Act. It governs interest in contracts for the supply of goods or services where the purchaser and the supplier are each acting in the course of business.[13] Under this Act, businesses and public sector bodies may claim interest on late payment of commercial debts arising from contracts at 8% above the Bank of England base rate. The base rate was increased on the 2nd August 2018 to 0.75%.[14] Hence, the commercial debts may receive post-judgment interest at 8.75%.

Additional (non-statutory) powers to award interest exist with regard to equitable remedies.[15] This deferred entitlement approach was adopted and continues to be used in most Commonwealth jurisdictions which began by adopting the 19th century English legislation.

United States

Unlike a nationally uniform law in the United Kingdom, the law governing interest in litigation in the United States is diverse. Each State prescribes a mechanism of calculating interest. Even in federal courts, interest is determined as per state law under the *Erie Doctrine* since interest is

[13] U.K., Late Payment of Commercial Debts (Interest) Act, 1988.
[14] Bank of England, "Interest Rates and the Bank Rate."
[15] The Law Commission, Report No 287: Pre-judgment Interest on Debts and Damages (House of Commons 2004), para 2.23.

considered part of the substantive claim.[16] Further, a contractual provision supersedes the statutory interest rate. Both state and federal courts have consistently held that the contract rate, rather than the statutory rate, governs the interest rate.[17] Such an agreed-upon rate provides clarity. It incentivizes prompt settlement rather than prolonged litigation that can potentially add an ever-growing sum of interest to any award.

This is true even if the interest rate specified in the contract is substantially higher than the statutory rate. In the *Good Hill Master Case*, pre-judgment interest at a 21% contractual default rate in a swap agreement turned a $22.1 million breach of contract claim accruing in 2009 into a $93.9 million judgment awarded in 2016.[18] The court stated, *"While the resulting judgment is large relative to the original award, this is no reason to depart from the legal principle that contracts must be enforced according to the language adopted by the parties."* This finding becomes more relevant in light of the fact that the statutory rate was 9%.[19]

Though interest rates vary according to the State, they often provide non-discretionary rates. For example, under New York law, the application of pre-judgment interest is outlined in NY CPLR § 5001(a). The legislature's use of the term "shall" in the statute has been found by the courts to

[16] Erie Railroad Co. v. Tompkins.
[17] Erie Railroad Co. v. Tompkins.
[18] Good Hill Master Fund L.P. v Deutsche Bank AG.
[19] Good Hill Master Fund L.P. v Deutsche Bank AG.

make pre-judgment interest mandatory, not discretionary.[20] The law sets forth 9% as the statutory rate of pre- and post-judgment interest.[21] Similarly, in California, interest accrues at 10% as specified in California Code of Civil Procedure § 685.010 (a).[22]

Indian Approach to Interest Law

The Indian approach to awarding interest in litigation has followed a mixture of three approaches: judicial discretion, fixed or capped rates, and the use of reference rates. It is characterized by a relatively complicated legislative framework, which has undergone substantial changes due to judicial interpretation. The interest rate can vary depending on the nature of the suit (applicable law) or period of litigation (pre-litigation, during litigation, and post-litigation). This leads to room for the judiciary to exercise its discretion. Judges vary in their interpretation of both the text and the purpose of the law.

[20] Spodek v. Park Property Development Association.
[21] Certain statutes do provide alternative rates (particularly on judgments against governmental entities). The New York State Finance Law provides that the interest rate on judgments against the state shall not exceed nine per centum per annum. The language permits courts to apply a lower rate upon evidence warranting a departure from the presumptive 9%..
[22] California, California Code of Civil Procedure.

Legislative Approach

The first legislation governing interest in litigation in colonial India was the Interest Act 1839. It was a response to a case was about delayed payment on a promissory note.[23] The King's Bench confirmed that common law courts had no power to award interest on any loan unless the loan document provided such interest. As a precedent, it meant that parties would not be entitled to any interest in unforeseen circumstances. The judgment was a shock to the commercial world as it put creditors at a disadvantage. It set off several legislations to correct this position.[24] In India, the East India Company enacted the Interest Act 1839, which empowered the courts to grant interest for debts or other monetary claims.[25] The legislation did not provide much guidance to the judiciary on the rate to be awarded. It merely stated that the court could award interest, which *did not exceed the current interest rate.*

There were no general rules on interest till 1881 in India. After 14 years of drafting, the Negotiable Instruments Act 1881 codified the regulation of negotiable instruments in British India.[26] While not covering all disputes, it covered a significant proportion of commercial activities carried out through negotiable instruments like cheques, promissory notes, etc. The

[23] Page v. Newman.
[24] In the UK, the position would be reversed by the Judgments Act 1838.
[25] India, Interest Act, 1839.
[26] Law Commission of India, "Report on the Negotiable Instruments Act, 1881."

1881 law provided that the court would award interest at the rate mentioned in the instrument, if any. If the instrument did not mention a rate, the court would award interest at the rate of 6%. This was in contrast with the U.K., where judges had discretion to set interest rates.[27] While there is no evident reasoning why the rate of 6% was chosen, it seems to follow old usury laws in the UK.

The next major legislation to deal with interest rates in litigation was the CPC 1908. § 34 of the law provided discretion to the judge to award interest (at a reasonable rate) in a decree to pay money. Additionally, the provision clarified that the court had the power to grant interest for any of the three periods, i.e. (i) any period before the institution of the suit *(pre-litigation)*; (ii) from the date of the suit to the date of the decree *(pending-litigation)* and; (iii) from the date of the decree to the date of the payment (or any earlier date) (See fig. 1).

The next change in interest laws would be in independent India. In 1955, the government moved a large number of amendments to the CPC 1908. One of the amendments proposed was a change to § 34, the provision governing interest in litigation. The government proposed to take away the discretion of the courts in awarding interest for the post-litigation period.[28] The bill was referred to a select joint parliamentary committee and would come up for discussion next year in

[27] U.K., Bills of Exchange Act, 1882.
[28] Parliament of India, "Parliamentary Debates. House of the People for 2nd August 1955."

November 1956. In the revised bill debates, the only issue of interest was brought up as the last statement on the bill. Shri Mulchand Dube, a member, pointed out that the bill prohibited interest on litigation costs. According to him, this would work against the poor because they would not be able to borrow to pay for the litigation.[29] The 1956 amendment did not completely take away the court's right to award interest in the post-litigation period. It capped the interest rate to 6%. Again, there was no detailed economic rationale for this cap. It seems that the legislature/drafter merely borrowed the cap in the NI Act 1881 and brought it to govern the post-litigation phase. Courts could now award up to 6% interest for this period.

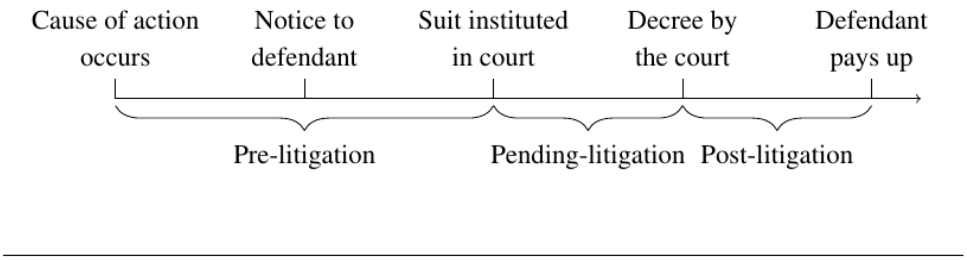
The limit started creating perverse incentives. As figure 2 shows, the inter-bank lending rate was around 4% in the 1950s. By the mid-70s, this rate had gone up way beyond 6%. In effect, the relatively risk-free lending between banks was at a higher interest rate than the statutory cap inserted in § 34 of the CPC 1908. It was *profitable* for defendants who had lost a case to delay repayment of money even after a decree/judgment was passed against them. For that period of delay, the successful plaintiff could collect only 6% simple interest. On the other hand, the defendant was, in effect, holding on to money, which even at the risk-free rate, would have cost more. Therefore in 1976, the CPC 1908 was again amended. A special case was created for commercial contracts under § 34. In such commercial contracts, for the post-litigation period, the

[29] Parliament of India, "Parliamentary Debates. House of the People for 14th November 1956."

rate could now exceed 6%. Further, the court could award the contract rate agreed to by the parties for the post-litigation period. If there was no contract between the parties, the court could award interest at *the rate at which money is lent or advanced by nationalized banks for commercial transactions.*

Two years after changing the post-litigation period interest, the legislature would pass the Interest Act 1978. This legislation was developed after comments from the Law Commission of India. For the first time, the Commission referred to an economic analysis of interest payment in litigation. It highlighted the economic theory of the *time value of money* as a justification for awarding interest. This law repealed the Interest Act 1839. However, instead of talking about the court's general power to award interest, it covered only the pre-litigation period, specifically, from the service of notice to the suit's institution. The Interest Act 1978 set up different rates of interest for different types of disputes. For cases arising out of an agreement or notice, the court could award interest for the pre-litigation period at the best bank-deposit rate. However, by repealing the 1839 law, the legislature became silent about interest for the periods pending-litigation. Figure 1 shows the different stages into which the interest awarded is broken down in Indian law.

Figure 1. Indian law breaks up interest in litigation into three stages.



Indian inflation and fiscal failures reached their peak in the early 1980s (figure 2). By this time, the 6% rate had become far lower than even the risk-free lending between banks. With a clogged-up judiciary, India was facing a crisis of negotiable instruments. People would write cheques and simply refuse to honor them. In 1988, the Banking, Public Financial Institutions and Negotiable Instruments Laws (Amendment) Act 1988 criminalized writing cheques beyond the balance in the drawer's account. Additionally, the law also increased the interest rate on delayed payment of negotiable instruments (fixed in 1881) to 18%. The bill stated that this change was being done *"with a view to discouraging the withholding of payment on negotiable instruments*

on due dates".[30] At this time, the inter-bank rate in India was around 11.5%. In effect, the amendment moved the interest rate from 6% *below* the risk-free rate to 6% *above* it.

The present law has led to a scenario where interest rates vary depending on the nature and period of the dispute. This goes against the generally understood principle of "money is money". The time value of money should not change depending on the kind of dispute. For example, a successful plaintiff gets 18% interest if a cheque issued to her does not fructify; however, she would get no more than 6% interest (one-third of the interest under the NI Act 1881) if she suffered any other form of loss. In 2005, India passed a new law to protect small firms from delayed payments and the law set an unusually high interest rate of 20%.[31] The different rates of interest awarded in different laws of India is represented in table 1.

[30] India, Banking, Public Financial Institutions and Negotiable Instruments Laws (Amendment) Act, 1988.
[31] India, Micro, Small and Medium Enterprises Development Act, 2006.

Table 1. Statutory interest awarded in India differs based on the nature of the dispute.

Act	Section	Rate
Code of Civil Procedure	34	
	Non-commercial	6.00%
	Commercial	8.76%
Negotiable Instruments Act	80	18.00%
MSMED Act	16	20.25%
Interest Act	3	10.00%

Judicial Approach

Indian jurisprudence, faced with a combination of legislation on payment of interest, has come up with the judicial innovation of breaking up the interest payment into the three phases discussed before. This has been done to harmonize different laws governing the rates of interest. The courts have stated (in the absence of any legislation) that the amount of interest to be paid for the period before the suit was instituted is a question of substantive law, and the amount

awarded afterwards is a question of procedure.[32] The interest during the period the suit is pending is left to the discretion of the court.

Indian courts usually award low interest rates. Sometimes, even below what a plain reading of § 34 of the CPC 1908 requires. One reason for this could be the poor legislative drafting of the provision. The provision states that the court should award the interest rate agreed to by the parties, or the commercial rate specified by the central bank, in *commercial transactions*. However, the legislature has not adequately defined what constitutes a commercial transaction. The courts have interpreted transactions as not 'commercial' and thereby ignored the interest rate required under the legislation.

Saifuddin Muzzaffar Ali's case is an example of the court narrowing the definition of a commercial transaction.[33] Maharashtra had awarded a contract to Saifuddin (a private construction contractor) to build a bridge. However, the conditions at the location were not as promised by the State. When Saifuddin demanded higher costs, the State Government refused. This led to litigation. Saifuddin succeeded and demanded interest as per the rate specified for a commercial contract under § 34. The High Court held that since building bridges is the *"sovereign duty"* of the State Government, the court would not award the commercial rate, but

[32] B. N. Rly. v. Ruttanji Ramji, PC AIR; Vijaya Bank v. Art Trend Exports, 1955 AIR Cal.
[33] State of Maharashtra v. Saifuddin Muzzaffar Ali Saifi, 1994 AIR BOM.

the non-commercial rate of 6%. The court conflated the duty of the government with the duty of the private contractor hired by the government. While the broader objective of building the road may be social, it was not the private contractor's objective. The court completely ignored the fact that the contractor had been awarded the contract on commercial terms after a competitive bidding process.

The Bombay High Court did a similar conflation in the *Prakash Birbhan Kataria* case.[34] The defendant had borrowed money to build a hospital from the plaintiff bank. When he failed to repay the amount, the bank sued for money with interest. The court stated that since hospitals are generally built for charitable/non-profit goals, the contract between the bank and the borrower was also not commercial and awarded 6% interest against the prevailing commercial rate of 15%. The court confused the objective of the borrower with the objective of the bank, which had lent on commercial terms. Courts have also held certain types of transactions to be non-commercial based on custom. For example, in *Jainarain Choudhary v Biseswar Prasad and Ors*, the court refused to award commercial interest rates on arrears of rent since it is not customarily charged. Courts have gone far enough to state that a grant of interest should not be ordered in the absence of a contract or a custom to award interest on arrears of rent.[35]

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[34] Dena Bank v. Prakash Birbhan Kataria, Bom AIR.
[35] Jainarain Choudhary v. Biseswar Prasad and Ors.; Lallu Singh v. Lala Chander Sen; Nanchappa Goundan and ors. v. Vatasari Ittichathara Mannadiar.

Indian courts have consistently emphasized the role of *discretion* of the court in matters of interest. Courts have consistently interpreted provisions to widen their discretionary powers even where the statute or the agreement should have ousted discretion. *United Bank of India v Rashyan Udyog* involved a bank loan to the defendant. The defendant requested a reduction in the interest rate due to hardship. The bank refused. In deciding the case, the Calcutta High Court held, to achieve *socio-economic justice*, the court had the discretion to *"...mould our laws, both legislative and judicial..."*. The court removed all interest to be paid and required the borrower only to return the principal amount.[36] In *State of Madhya Pradesh v Nathabhai Desaibhai Patel*, the defendant realized ₹62,518 under false pretence. The defendant withheld the amount as sales tax from his customers but did not pay it to the government. The Supreme Court disallowed the interest claimed by the government up to the date of the suit. It noted that the court was within its discretion to not award interest up to such a period.[37]

Even whether interest will be awarded has been left to the discretion of the courts. *Union of India v Panipat Woollen and General Mills Co Ltd* is an example where the court disallowed interest. In this case, the plaintiff's goods were misdirected and reached the correct destination: late, damaged, and less than the contracted amount. The court refused to award interest for the period before the suit's institution. The plaintiff had lost substantial money in the time it took to trace

[36] United bank of India v. Rashyan Udyog and ors., 1990 AIR Cal.
[37] State of Madhya Pradesh v. Nathabhai Desaibhai Patel, 1972 AIR SC.

the goods and had been forced to shut down his factory due to a shortage of inputs. The court reasoned that granting interest would amount to awarding *"damages on damages"*, which could not be permitted.[38] Similarly, in *Seth Thawardas Pherumal v Union of India*, a dispute arose between a brick supplier and the Government of India. In the following arbitration, the arbitrator awarded interest to the supplier at 6%. The Supreme Court held that since there was no demand in writing for the interest due, it could not be awarded.[39]

In the absence of statutory requirements, courts usually lay down *legal tests* to determine a question of law. This allows parties to predict the behavior of the courts and make appropriate arrangements. However, in the case of liability to pay interest, the courts have refused to lay down tests to determine interest rates, or even if any interest will be paid. In *Vijaya Bank v Art Trend Exports*, banks were recovering loans from a defaulting borrower. The Calcutta High Court, on the question of interest to be paid, ruled:

> *"It will depend on the facts and circumstances of each case, including the conduct of the parties before and after the suit. It all depends [on] what is considered to be reasonable in the facts of each case."*[40]

[38] Union of India v. Panipat Woollen and General Mills, 1967 AIR P&H.
[39] Seth Thawardas Pherumal v. Union of india, 1955 AIR SC.
[40] Vijaya Bank v. Art Trend Exports, 1955 AIR Cal.

The Supreme Court also exempted judges from providing a reasoned order on how the rate is determined unless the parties objected to the lower rate award.[41]

While exercising their discretionary power to award interest, we find that the courts usually award lower interest rates. In *Pure Helium India Pvt Ltd v Oil and Natural Gas Commission*, the fluctuation in the exchange rates led to a disagreement in the payment due to Pure Helium.[42] In arbitration, the arbitrator awarded ₹ 10.3 million (US $ 149 thousand) with interest at the rate of 18% to Pure Helium, but in the appeal, the High Court set aside the award. In the second appeal, the Supreme Court ruled in favor of Pure Helium but reduced the interest rate to 6%. In *C.K. Sasankan v Dhanalakshmi Bank Ltd*, the plaintiff had defaulted on a loan from the respondent. The Debt Recovery Tribunal awarded interest at 25% for the period before the judgment and 19.4% after that. The Supreme Court found that the interest rate was *"exorbitant"* and directed that the interest be paid at 9%. It noted that such a rate was *"just, proper and reasonable"*.[43]

Similarly, in *NM Veerappa v Canara Bank*, the plaintiffs defaulted on their mortgage loan from the defendant. The trial court awarded post-litigation interest at 6%. In the appeal, the High Court increased this rate to 12%, compounded monthly. In the second appeal, the Supreme Court

[41] Laxmichand v. Indore Improvement Trust, 1975 AIR SC.
[42] Pure Helium India v. Oil and Natural Gas Commission, 2003 AIR SC.
[43] C.K. Sasankan v. Dhanalakshmi Bank, 2009 AIR SC.

noted that the trial court had the discretion in awarding interest, and there was no reason for the High Court to interfere with the same. It thus restored the interest at 6%.[44]

The power to overrule interest has been extended to cases where there is no finding of abuse by the party gaining interest payments. In *State Bank of Mysore v GP Thulasi Bai*, the court observed that: *"it is no longer obligatory on the Courts to decree interest at the contractual rate . . . even if there is no question of the rate being penal, excessive, or substantially unfair"*. In this case, the contractually agreed rate was 2.5% above the *bank rate*, subject to a minimum of 14%. Overriding the contract, the court awarded interest at 6% from the date of the suit.[45] The only reasoning provided for this change was that the court had the discretion to do so. Similarly, where the defendant had agreed to repay the loan at 24% interest, the Delhi High Court lowered the rate to 12%. The judge observed that *"in [his] view"*, the interest rate was on the higher side, without providing any reasoning for the same.[46] This reasoning has also been extended to commercial contracts.[47] Courts have even overruled rates set by legislation (Interest Act 1978) to award lower rates.[48]

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[44] N.M. Veerappa v. Canara Bank, (1998) 2 SCC.
[45] State Bank of Mysore v. G.P. Thulasi Bai, 1985 ILR KAR; Soli Pestonji Majoo v. Gangadhar Khemka, 1969 AIR SC.
[46] Ashish Jain v. Kapil Gupta.
[47] Syndicate Bank v. West Bengal Cements, 71 (1991) CompCas.
[48] Union of India v. Watkins Mayor and Co., 1966 AIR SC; Vithal Das v. Rupchand, 1967 AIR SC.

As a rule, post-judgment interest is now granted at a lower interest rate than the period before the institution of the suit. Courts have reasoned that after the judgment, the plaintiff gets the security of the of a decree. In *Amar Chand Butail v Union of India and Ors*, the appellant was a food grains supplier to the government. The government defaulted in buying grains from Amarchand. Consequently, Amarchand was left with food grains worth about ninety-four thousand rupees. He thus claimed payment of this amount, along with interest, at the rate of 9%. The Supreme Court held that whatever may be the position before the suit, the interest could not be awarded post-litigation at 9%. Without assigning any other reason, post-litigation interest was reduced to 4%.[49]

Given its approach of granting interest that does not correspond with market rates, it is interesting that the Supreme Court has not been entirely ignorant of the incentives it is creating. In 2011, Justice Bhandari, speaking for the court, acknowledged that awarding simple interest in a market governed by compounding created a difference in what the court could award and what a malicious litigant could earn. He noted:

> *"In fact, …this difference [that] prompts much of our commercial litigation because the debtor feels - calculates and assesses - that to cause litigation and then to contest with obstructions and delays will be beneficial because the court is empowered to allow only simple interest."*[50]

[49] Amar Chand Butail v. Union of india, 1964 AIR SC.
[50] Indian Council for Enviro-Legal Action v. Union of India, 8 (2011) SCC.

A few judgments since the 1990s have bucked this trend of awarding lower interest rates. In *Union Bank of India v Narendra Plastics,* the contractual interest rate between the parties was 17.5%. The trial court directed the defendants to pay interest at the rate of only 13%. Allowing an appeal by the plaintiff, the High Court held that *"it would not be proper for the courts to arrogate to themselves the task which has not been assigned to them"* and allowed the contractual rate.[51] Similarly, in *B Shivananda v Andhra Bank Ltd,* Shivananda had taken a loan from Andhra Bank to build a theatre. When the borrower failed to repay, the bank sued and succeeded. The trial court disallowed any interest. In the appeal, the High Court allowed interest at the contracted rate of 16.5%. When the borrower challenged the interest rate in appeal, the Supreme Court held that the contracted interest rate should be permitted, and hence, there was no reason to interfere with the decision of the High Court.[52]

Though it is apparent that some judgments have been reflective of a modern understanding of interest, the trend has been to grant interest depending on the parties and the course the litigation takes. This has resulted in incentives being created for the parties to cause a delay.

[51] Union bank of India v. Narendra Plastics, 1991 AIR Guj.
[52] B. Shivananda v. Andhra Bank, 4 (1994) SCC.

Incentive implications of the Indian approach

Interest in litigation is based on the principle of *restitutio in integrum*. It aims to restore the injured party to the state of things before the injury was incurred. This includes compensating the party for the time value of money losses due to delay in payment. However, there are no clear guidelines on how this is to be accomplished. The legislation, coupled with innovative judicial interpretation, has resulted in parties forming incentives to delay litigation. Courts have also refused to enforce contracts on the grounds of *'justice'*. This leads to a high degree of variance and consequent uncertainty in the law.

Perverse Incentives

Low interest rates create perverse incentives for the defendant to cause a delay in litigation. A defendant who can receive a return at a higher rate than the interest she has to pay under a judgment would prefer to cause delay and benefit from the difference in the two rates. The statutory provisions create this condition in almost all cases. The CPC 1908 provides that interest shall be awarded at 6%. This rate was introduced in 1956 and has remained unchanged since then. In 1956, the rate of 6% was close to the bank rate. The rate at which the central bank lends money to domestic banks. Between 1956 and 1964, the bank rate averaged 4.11%. However, as figure 2 shows, the bank rate continued to rise since then. In 1991, the bank rate was 12%, double the prescribed rate.

Following the rate fixed in 1956 implies that interest granted by courts has become less and less in line with market rates. The statutory rate had some resemblance to the prevailing rates when it was introduced; however, it no longer approximates the value of money. If interest rates on

judgment are below the borrowing cost, they create incentives for parties to cause a delay. This has been true from 1970 till 2019, when the bank rate was 6.5%.

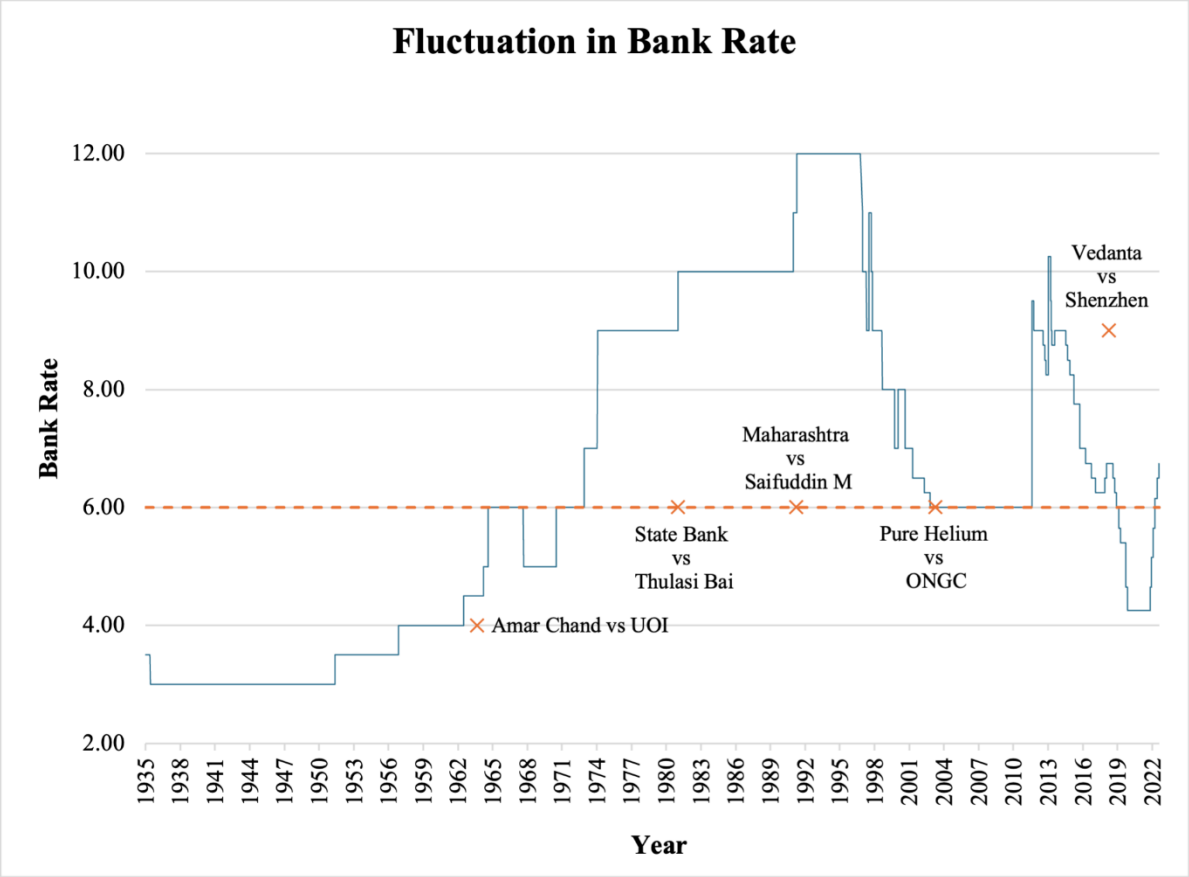
Table 2. Difference between judgment interest and risk free rate in some jurisdictions.

Jurisdiction	Post Judgment Interest Rate (A)	Risk-Free Rate (B)	A-B
United Kingdom	8.75%	0.93%	7.82%
California	10.00%	2.25%	7.75%
New York	9.00%	2.25%	6.75%
Australia	7.50%	1.49%	6.01%
Canada	3.45%	1.58%	1.87%
India (commercial)	**8.76%[1]**	**7.13%**	**1.63%**
India (non-commercial)	**6.00%[1]**	**7.13%**	**-1.13%**

India is unique in awarding interest at lower than the risk-free rate. As table 2 shows, India's judicial interest rate has the smallest differential from its risk-free rate (for commercial transactions) amongst major common law jurisdictions. This difference becomes negative when we consider non-commercial transactions. Interest gained from even *slightly* risky investments is likely to be higher than this. Thus, Indian litigants who are being sued for damages have the highest incentive to drag on litigation. In the past, when risk-free rates in India were higher

(figure 2), it was *rational* to delay the final judgment and make money from the difference between the risk-free rate and judgment rate.[53]

Figure 2. Bank rates have been higher than the interest rate awarded by courts.



[53] For example, in the 1990s, the bank rate was around 11%. If the dispute were a non-commercial dispute, the successful party would make 11% - 6% profit on the sum in dispute for every year of delay.

Another way of looking at adequate interest rates is to consider the return on a well-diversified portfolio. This is the rate of return a defendant can expect on her investment. The interest rate provided by law is well below the returns on a diversified portfolio of Indian equity. The NIFTY 50 is a widely traded broad-based stock index in India. Over the last 20 years, it has yielded a Compounded Annual Growth Rate (CAGR) of 12.76% and has gone as high as 20%. Thus, if a defendant is required to pay interest at 6%, she would still gain a real interest of 6.76% (12.76 less 6), on average, for every year of delay. This would double the investment in approximately 10 years, the average age of a case in India.

Vedanta Ltd v. Shenzhen Shandong—an Example

One decision of India's Supreme Court represents the problem of low interest rates succinctly--*Vedanta Ltd v Shenzhen Shandong Nuclear Power Construction Co Ltd*.[54] In 2008, Vedanta entered into four contracts with Shenzhen Shandong to construct a power plant. In 2011, disputes arose between the parties, which resulted in the contracts being terminated. Shenzhen initiated arbitration to recover dues from Vedanta. However, since the contracts did not contain any clauses determining interest, the arbitrator had the discretion to award the same.

[54] Vedanta Ltd. v. Shenzhen Shandong Nuclear Power Construction, 2018 AIR SC.

Shenzhen raised claims in three currencies of ₹ 4472 million, US $ 2.38 million and, 121.72 million along with interest at 18%. The arbitrator passed the final award in 2017. He awarded ₹ 605.37 million and 23.72 million to Shenzhen with a single interest rate of 9% on both the Rupee and the Euro award. However, the award came with a condition. If Vedanta failed to pay the amount in 120 days, it would have to pay Shenzhen interest at 15% for the period after the 120 days. Aggrieved by the order of the arbitrator, Vedanta appealed to the Supreme Court of India.

The Supreme Court modified the order of the arbitrator in two ways. First, it set aside the condition that interest would be hiked to 15% if Vedanta failed to pay within 120 days. Second, the Supreme Court found the interest rate of 9% on the Euro component of the award to be *"unjustified and unwarranted".* Consequently, the court reduced the interest rate to the London Inter-bank Offered Rate (LIBOR) + 3% (implying 2.62%) on the Euro component.[55] The court left the rate of 9% interest on the Rupee component undisturbed.

Was the rate reduction by the Supreme Court appropriate? We can estimate Vedanta's borrowing costs from its financial statements. Five months after the Supreme Court's decision, in April 2019, Vedanta issued US Dollar-denominated bonds in London. The interest Vedanta had to pay was 8.75%.[56] Since the US Dollar is a freely convertible currency, Vedanta's Euro borrowing

[55] The Arbitral decision was given on 9th November 2017. The prevailing LIBOR rate was *negative* 0.38%.
[56] "Vedanta Raises US$1 Billion Dual Tranche Bond."

rate would be similar. From Vedanta's financial statement data, we estimated its blended cost of rupee borrowing for 2018 to be 15.22%.[57] Under the *forced loan theory*, the plaintiff should have been awarded interest at these rates. This would have been *adequate* compensation.

Table 3 shows the difference in amounts that Vedanta had to pay due to the Supreme Court's reduction. The interest clock started in 2012, when the arbitration was instituted. The judgment of the Supreme Court came 7 years after this event. We extend the calculation to 15 years. Column (A) shows the interest Vedanta would be required to pay as per the arbitrator's decision. Column (B) shows Vedanta's interest liability as per the Supreme Court's order. Column (C) is Vedanta's borrowing cost in 2018-19. The next two columns show the Supreme Court's reduction and the difference between Vedanta's borrowing cost and the interest it had to pay under the judgment, respectively.

Reducing interest rates may create perverse incentives to lengthen litigation. Compared to Vedanta's borrowing cost, the arbitrator had awarded a lower interest rate on the Rupee component, but the appropriate rate on the Euro component. The Supreme Court reduced the interest rate on the Euro component of the decision. The reduced rate is below the rate at which Vedanta can borrow from the open market. In effect, every year of delay saves Vedanta the difference in interest rate multiplied by the total award. This starts from 10.86 million (45.78%

[57] Centre for Monitoring the Indian Economy, "ProwessIQ."

of the Euro award) in the first year after the court's decision and goes up to 34.35 million in year 8 (144.81% of the award).

Table 3. Benefit to Vedanta from lowering of interest rate by the Supreme Court of India

Rupee Component of Award (in millions)					
Years since institution	**Arbitration (A)**	**Supreme Court (B)**	**Borrowing Cost (C)**	**Gain from appeal (A-B)**	**Gain from the law (C-B)**
(April, 2012)	**Rupee (9% + 15%)**	**Rupee (9%)**	**Rupee (15.22%)**	**Rupee**	**Rupee**
7	386.27	379.40	641.61	6.87	262.21
9	566.93	487.80	824.92	79.13	337.12
11	747.60	596.20	1008.24	151.40	412.04
13	928.26	704.60	1191.56	223.67	486.96
15	1108.93	813.00	1374.87	295.93	561.87
Euro Component of Award (in millions)					
Years since institution	**Arbitration (A)**	**Supreme Court (B)**	**Borrowing Cost (C)**	**Gain from appeal (A-B)**	**Gain from the law (C-B)**
(April, 2012)	**Euro (9% + 15%)**	**Euro (2.62%)**	**Euro (8.75%)**	**Euro**	**Euro**
7	15.21	4.35	14.53	10.86	10.18
9	22.33	5.59	18.68	16.74	13.08
11	29.44	6.84	22.83	22.61	15.99
13	36.56	8.08	26.98	28.48	18.90
15	43.67	9.32	31.13	34.35	21.81

The first column represents the time since the institution of the dispute. Thus, seven years means that the amount would be paid in April 2019.

As long as the interest rate awarded by the courts is lower than the borrowing costs of the defendant, the defendant has an incentive to delay payment. This can be achieved by lengthening the litigation through dilatory tactics like numerous adjournments, delay in producing documents, frequent interim applications, and appeals to higher courts even when there is no chance of the decision being overturned.

This incentive to delay holds even in disputes involving smaller amounts. Let us consider a hypothetical case between P and D, where D owes P ₹ 1 million. Most unsecured borrowing in

India is at 18%. Assuming that the court awards interest at the rate of 6%,[58] D reduces his liability by increasing the litigation time. Every year of delay gives D a benefit of 12% (18 less 6) on the amount in dispute. If the courts award simple interest, like they usually do, D can recoup the entire amount due by delaying the case for 5.04 years. Even if the courts award compound interest, D will effectively pay no amount if she can delay the judgment by 5.17 years.

It may be argued that delay also increases the defendant's legal costs. Consequently, they have nothing to gain from delaying the matter. Though this may be a factor, it is unlikely to decide the defendant's incentives. In the Vedanta example, assuming that the defendant hires the most expensive lawyers in India, appearance costs would not be more than ₹ 1.2 million.[59] With an average of one hearing every two months, this would not be more than ₹ 50.4 million for 7 years, which can give a benefit of ₹ 723 million (₹ 6.87 million and 10.86) to the defendant.

Uncertainty

Apart from the incentive to stretch out litigation, the provisions governing interest in Indian legislation and their judicial interpretation cause uncertainty of outcomes. The uncertainty can be at three levels (i) whether interest will be awarded or not? (ii) Whether it will be awarded as per

[58] 6% is the prescribed rate under CPC 1908. Courts frequently award rates lower than this.
[59] India TV Lifestyle Desk, "10 Highest-Paid Lawyers in India."

the agreement of the parties? (iii) What rate will be awarded if it is not at the contracted rate? The economic consequences of this uncertainty will be either that parties will not enter into contracts, thereby reducing economic activity; or parties will try to mitigate this uncertainty by contracting with only known counterparts; or require excessive guarantees.

Because courts have repeatedly emphasized that award of interest comes under the purview of *judicial discretion*, even when statutes require interest to be awarded, courts have interpreted laws to ignore such requirements. In *State of Madhya Pradesh v Nathabhai Desaibhai Patel*, the Supreme Court held that *"the question whether interest should be awarded on the principal amount claimed from the date of the suit, was within the discretion of the court"*.[60]

Even when parties have provided interest payments for damages in their agreements, it is not certain that the courts will uphold them. In *State Bank of Mysore v GP Thulasi Bai*, the contract rate of 14% was reduced to 6%.[61] This is against the spirit of the contract and only furthers India's poor contract enforcement regime. If contracts are not upheld, the risk of doing business in India goes up significantly. An efficient contract enforcement mechanism provides remedies to aggrieved parties and dissuades violation of the contractual obligations.

[60] State of Madhya Pradesh v. Nathabhai Desaibhai Patel, 1972 AIR SC.
[61] State Bank of Mysore v. G.P. Thulasi Bai, 1985 ILR KAR.

Poor contract enforcement tends to increase the risk and reduce the returns (increased legal costs), affecting the overall risk to return ratio. As a result, businesses may not engage in economically and socially beneficial transactions.[62] The absence of these exchanges hinders investment and growth. Poor legislative drafting also contributes to this problem. The 1956 amendment drastically reduced the interest rate that courts could award. In 1976 when the legislature tried to correct the situation, it did not do so on sound economic principles.

When courts change the interest rate awarded, they rarely provide the reasons for doing so. Sometimes, the court merely states that the rate is too high, while at other times, the same rate is considered reasonable. In *NM Veerappa v Canara Bank*, the court held that interest would accrue at "6% as it was a *reasonable rate*".[63] This is compounded by the refusal of the judiciary to state any tests to determine interest rates. This has created considerable variation in the rates awarded and can often result in large differences even when similar facts arise but are heard by different benches and courts.

[62] Hart, "Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships."
[63] N.M. Veerappa v. Canara Bank, (1998) 2 SCC.

Way Forward

Interest laws in India create incentives for introducing a delay in litigation and create uncertainty of contract enforcement. This paper is not a definitive finding on the causes of delay in the Indian judiciary or India's poor ranking for enforcing contracts. However, our analysis shows that the law on awarding interest is not based on sound economic principles. Updating statutory provisions to align interest awarded in litigation with economic costs serves two objectives. It appropriately compensates the wronged party and brings her closer to the objective of civil litigation, i.e., adequate compensation. Besides, it removes incentives for the party at fault to delay the final adjudication of the dispute. This may open up more judicial time allowing the courts to resolve more disputes.

To achieve a sound law on awarding interest, two changes have to be brought about in Indian legislation: *consolidation* and *rationalization*. Multiple legislations like the CPC 1908 and the Interest Act 1978, which govern the same transaction, have led to confusion about the applicable rates of interest in various stages of the dispute. While specialized legislation like the NI Act 1881 and the MSMED Act 2006 may be more precise and award more rational interest rates, they are limited in their scope. There is no economic rationale to limit interest awarded to the successful plaintiff depending on the nature of the dispute. Such categorization creates incentives for parties to actively structure transactions to get covered by specialized legislation.

An example of such attempts is the prevalent practice of collecting post-dated cheques. The law governing cheques (the NI Act 1881) specifies interest at the rate of 18% rather than the standard 6%. In many agreements for the sale of goods or rent agreements, the seller or landlord requires

the buyer or tenant to hand over cheques representing future payment. The buyer/tenant then marks these cheques with dates in the future when the good is to be delivered or when the rent becomes due. This protects the landlord or seller because they can recover interest at a higher rate. However, it puts the buyer/tenant at a disadvantage. Such a buyer/tenant cannot withhold payment if the seller fails to deliver, or the landlord fails to uphold their end of the bargain. This is further compounded by the fact that India has criminalized failure to honor cheques. Therefore, a stop order to cancel such post-dated cheques may invite criminal prosecution. This creates two proceedings: one criminal and one civil, in place of a single contract dispute.[64] A single law awarding interests in all proceedings would remove such incentives.

When consolidating interest payments under a single law, the legislature will have to determine an appropriate interest rate. Such a rate should be neutral to the nature of the dispute but consider the plaintiff and defendant's capital cost. Here, the legislature has to balance two considerations: fairness against ease of judicial adjudication. While finding the capital cost for parties in each dispute is the fairest solution, it is not possible in all cases, especially if they are individuals. However, if the parties had ex-ante agreed on a rate, such rate is the fairest approach. So, the court should award the agreed rate without exception.[65]

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[64] The holder of the cheque proceeds under criminal law to recover the payment. In contrast, the wronged buyer/tenant proceeds under contract law to be exempted from the obligation to pay.
[65] Exceptions in general contract law like fraud, lack of consent, or illegality may still apply.

If the parties have not agreed to a rate, it will still be left to the legislature to formulate a rule. If liabilities are always determined based on individual costs of capital, it will lead to uncertainty. The best approach in such cases is a reference rate. This also signals to parties, ex-ante, the interest that will be imposed on the commission of a tort, other civil, or contract violations. However, if the reference rate is too low, there will be an incentive to delay proceedings. Too high an interest rate, on the other hand, may create incentives to start litigation. Since starting litigation does not entitle the plaintiff to interest, i.e., the plaintiff still has to prove her case, it may be appropriate to slightly err on the side of a higher interest rate. We believe that the rate should be closer to the general costs of unsecured borrowing in the economy. This is an average cost for the economy and will be fair over a large number of cases.

The average borrowing cost in the economy is not fixed. Therefore, fixing the reference rate with a specific number in the legislation runs the risk of the rate becoming too low or too high as economic conditions change. An appropriate way would be to derive the relationship between the risk-free rate and the unsecured borrowing cost in the economy. The legislation could then specify that the interest rate will be a multiple of the risk-free rate, reflecting the unsecured borrowing cost in the economy. Currently, the MSMED Act 2006 uses a similar approach. § 16 specifies that the interest rate in litigation will be three times the bank rate. In June 2019, this was around 20%, close to the unsecured borrowing rate in India, and slightly higher than the rate of return on a diversified portfolio.

Interest should also be awarded as compound interest and not simple interest. This is because standard returns from economic activities are compounded. If a simple interest rate is awarded, it will usually not compensate the successful litigant adequately for the time value of the

claim/award. As per the National Judicial Data Grid, the mean lifetime of a case in India is 9.19 years. This does not include the time between the injury and the filing of the suit. It is not unreasonable to imagine a situation where it takes almost 10 years for the plaintiff to recover the damages.[66] At a rate of 20% (the interest payable under the MSMED Act 2006), this would result in a difference of over three times the principal amount between the two forms of interest.

Conclusion

Successful plaintiffs are not placed into the same position as before the dispute unless they are compensated for the time it took to recover damages. The interest awarded should be equal or close to the time value of money for the plaintiff. For a long time, this was left to the judges' discretion or fixed arbitrarily in the statute. However, economic analysis provides us with insight into the underlying principle that should govern how interest is paid: the opportunity cost of money for the plaintiff or the defendant. This may not be easy to compute in many cases. However, the farther the awarded rate is from this value, the greater the incentives for unwanted behavior. Indian legislation and jurisprudence are not based on this economic principle. The legislative framework is fragmented, poorly drafted, and has created confusing provisions. The rate cap in the general procedural law, set in 1956, is outdated. Since then, even the risk-free rate of borrowing has risen above the statutory rate. The judiciary has compounded these problems.

[66] Department of Justice, Government of India, "National Judicial Data Grid."

The jurisprudence on interest law suffers from two problems. It regularly awards interest at rates lower than the capital cost and is inconsistent while awarding interest.

The resultant system creates perverse incentives to lengthen litigation. While we do not find any direct evidence of this, analysis of the judgment in Vedanta shows that this is likely to be the case. Often, the interest awarded by the court is lower than the rate at which the defendant could have borrowed money from the market. Therefore, for the period that it takes to adjudicate a dispute, the defendant makes the difference between her borrowing cost and the rate awarded by the court. The larger the difference, the more money the defendant makes by extending the litigation. Similarly, the inconsistent approach to awarding interest makes contracting more difficult. Even if parties provide for interest in cases of breach, the court is not bound to enforce such contract provisions. Courts regularly override the contract or make unexpected judicial interpretations. This leaves the winning party with low or no interest on the amount claimed. This results in parties not entering into contracts, contracting with trusted parties, or demanding capital to be locked up as guarantees. All of which are impediments to a functioning economy.

Judicial delay in Indian courts is often attributed to a lack of judges or complex procedural requirements. The role of economic incentives in judicial delays has been ignored. These incentives may arise from various procedural and substantive legal provisions. Aligning incentives of actors may provide solutions to reducing delays and making the judicial system fairer.

MISSING WOMEN: AN EXPLANATION

By 2010, it was estimated that around 126 million women were missing.[1] The problem of *missing women* has received global attention since Nobel Laureate Amartya Sen wrote about it in 1990.[2] However, the problem pre-dates its widespread attention, as families have been resorting to sex-selective abortions since the 1970s when fetal sex determination became technologically feasible.[3] This technology has distorted the number of girls that are relative to sons, and it has more than wiped out the gains from reducing maternal mortality in the developing world.

Today, countries like India and China contribute to most of the *missing women* around the world, but other countries have also shown this trend.[4] Asia, Taiwan, Korea, and Vietnam also showed distorted sex ratios at birth ("SRBs") arising from sex-selective abortions, but such abortions have declined in Taiwan and Korea since the early 2000s.[5] Apart from these Asian countries, sex-selective abortions have also increased in many post-Soviet states since the collapse of the

[1] Bongaarts and Guilmoto, "How Many More Missing Women? Excess Female Mortality and Prenatal Sex Selection, 1970–2050."
[2] Sen, "More than 100 Million Women Are Missing."
[3] Ramanamma and Bambawale, "The Mania for Sons: An Analysis of Social Values in South Asia."
[4] Bongaarts and Guilmoto, "How Many More Missing Women? Excess Female Mortality and Prenatal Sex Selection, 1970–2050."
[5] Chung and Gupta, "The Decline of Son Preference in South Korea: The Roles of Development and Public Policy."

Soviet Union.[6] This is perhaps surprising because these countries had no cultural preference for sons before the collapse of the Soviet Union. Therefore, these post-Soviet countries challenge the prevalent explanations for son preference.

There is a considerable academic literature tracking the problem of missing women. However, the explanations for this phenomenon are varied and *unsatisfactory* because the explanations are not universal.[7] For instance, patriarchy and discrimination against women have been proposed as the explanation in multiple papers. However, these papers do not explain how many countries that legally discriminate against women show normal SRB. Another common explanation for son preference is historical and cultural factors. But this account does not explain the rise of sex-selective abortions in post-Soviet countries with no recorded preference in history or culture. Similarly, family structures and governance mechanisms have been proposed to explain East Asian countries. This explanation ignores exceptions like Thailand. Transition to capitalism and the related economic stress has been suggested as an explanation, but there are contra-examples like Cuba. Moreover, most literature does not explain the periods when SRB distortions arise in

[6] Michael et al., "The Mystery of Missing Female Children in the Caucasus: An Analysis of Sex Ratios by Birth Order."
[7] Dasgupta and Sharma, "Missing Women: A Review of Underlying Causes and Policy Responses."

different countries. For example, one recent paper has connected SRB distortions in China to land reforms, but the paper does not provide a mechanism for this connection.[8]

This artificial distortion of the SRB has negative consequences for society, as many men are left without the possibility of ever finding a mate. This has social and political consequences for countries that have unbalanced sex ratios. Such societies may show higher levels of violence because the lack of wives leaves a large number of men single and single men are more prone to committing violence.[9] A similar effect has been observed in parts of India where the SRB is especially distorted, as these regions have higher murder rates.[10] Additionally, the absence of women in areas with SRB leads to men trying to *obtain* women through illegitimate means like trafficking.[11]

Apart from social consequences, an unbalanced sex ratio in countries *may* have international security consequences. Hudson and Den Boer argue that when a large number of unattached men congregate, they may pose security challenges to the state.[12] The authors point out that in the past, wars would be a solution to reduce the number of excess men in societies as most casualties

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[8] Almond, Li, and Zhang, "Land Reform and Sex Selection in China."
[9] Messner and Sampson, "The Sex Ratio, Family Disruption, and Rates of Violent Crime: The Paradox of Demographic Structure."
[10] Dreze and Khera, "Crime, Gender, and Society in India: Insights from Homicide Data."
[11] Prakash and Vadlamannati, "Girls for Sale? Child Sex Ratio and Girl Trafficking in India."
[12] Hudson and Den Boer, *Bare Branches: The Security Implications of Asia's Surplus Male Population*.

in a war would be men. But with the reduction in violence, the authors fear that the countries with unbalanced sex ratios, in the present, may adopt a similar strategy to deal with the problem of many discontented young men who will never find mates.

This paper demonstrates that *land reforms* as the *global* explanation for sex-selective abortions leading to excess male births. Additionally, it proposes a *mechanism* that provides a global explanation for why families start preferring sons at specific points in time. This preference arises because of *land to the tiller* reforms, a standard legal change to redistribute land. The redistribution *per se* does not create son preference, but these reforms usually include provisions to ensure that land is only held by individuals who personally cultivate the land. To achieve this objective, laws in these countries impose restrictions on farming families who benefit from *land to the tiller* reforms. These restrictions imply that a farming family with daughters will lose access to their land (source of income) once the first generation is too old to *personally cultivate* the land. Consequently, farming families are forced by economic consequences to undergo sex-selective abortions in *land to the tiller* reform countries.

Using data on SRB's, this paper demonstrates that distortions arising from land reform are visible when the mechanism's principles are tested against the countries known for distorted sex ratios, like India and China. Both countries implemented similar land reforms but from different historical backgrounds. China implemented them to undo collectivization, while India implemented similar reforms to undo the feudal system it inherited at independence. However, both countries end up placing similar restrictions on farmers by tying them to the land and restricting exit from farming. In contrast, Bangladesh's land reform did not tie a tenant farmer,

and therefore, did not create similar pressures on farming families. Bangladesh's superior SRB reflects this lack of pressure to produce sons.

Like China and India, East Asian economies also showed SRB distortions in the late 1970s and early 1980s. However, unlike China and India, Korea and Taiwan have reversed the trend, and SRB has reached close to natural levels. This improvement in SRB has been attributed to better education of women and a reduction in traditional beliefs. Instead, the rise in SRB and its return can be explained by the same *land to the tiller* reforms. SRB distortion in Korea and Taiwan follows legal reforms to implement *land to the tiller* laws on farmers. Subsequently, these legal restrictions were repealed in these two countries, and, as the model predicts, SRB started returning to natural levels. In contrast, Vietnam implemented *land to the tiller* reforms later than Korea and Taiwan, and in line with the mechanism, Vietnam's SRB deterioration started *after* the reforms. These reforms have yet to be undone in Vietnam, which explains why Vietnam still shows highly distorted SRB in favor of sons.

In addition to East Asia, the model explains SRB distortion in post-Soviet States. Interestingly, these countries chose one of two paths. In the first path, countries implemented *land to the tiller* reforms. In the second path, countries restored land to the pre-communist revolution owners or their heirs (commonly called restitution). This difference in approach to land reforms is reflected in the SRB distortion visible in some ex-Soviet countries but absent in others. Therefore, the collapse of the Soviet Union provides an interesting natural experiment (with some endogeneity) on SRB distortions from land reforms. The results of this experiment confirm the model proposed in this paper.

Governments have been aware of SRB distortion in their countries and have attempted remedial measures to address this issue. However, these remedial measures are based on misidentifying the *root cause* of SRB distortion in the existing literature. The model proposed here explains the cause of the *missing women* phenomenon and provides ideas for appropriate policy solutions to address the problem.

This article proceeds as follows: The first part of the article lays out the problem of *missing women*. While many reasons may cause excess female mortality, excess male births can only arise out of sex-selective abortions. Today, most of the missing women can be attributed to this distorted SRB observed in some countries. This distortion has been recorded and estimated for a long time, but the literature on what motivates families to abort the girl child is incomplete. The second part of the paper summarizes the present explanations for missing women and then demonstrates why those explanations fail to provide a global motivation for the phenomenon. After that, the introduces a global explanation for missing women. This part explains the features of a type of land reform called *land to the tiller* reforms that may pressure farming families to prefer sons or else lose possession of their land. The fourth part of the paper uses the mechanism to explain missing women in the two countries that account for the majority of the phenomenon: India and China. Then, the paper explains how similar reforms in East Asian countries explain son preference in those countries. The nest part of the paper exploits a natural experiment that arose with the fall of the Soviet Union. Countries in the Soviet bloc had two choices to return state land back to farmers. This part shows that this difference in policy choices explains why some ex-Soviet bloc countries saw son preference while others did not. The final part of the paper explains a positive trend seen in two countries where the SRB is now trending back to

normal levels. This part shows that the mechanism in this paper also explains the SRB improvement observed in these countries. The paper concludes by suggesting that understanding the cause of missing women is essential for legal and policy changes needed to address the problem.

The Problem of Missing Women

Some countries, at different points in time, seem to demonstrate a preference for one sex over the other. In the literature, this has been described as *son preference*, where families prefer that their children be male as against being neutral to the gender of the child. This preference may be expressed through increasing levels of intensity. At the low end, people may merely hold opinions about the superiority of the male gender over the other but not act it out. In the middle, this preference may lead to lesser investment in a girl child in terms of education or nutrition. At the extreme end, this preference may lead families to actively *cause* the death of a girl child.

In the past, this preference for a son would be mitigated by the fact that there was no way of knowing the sex of a child before the child was born. However, this lack of knowledge changed with technological development in the early 1970s. The sex of the fetus could be identified first with *amniocentesis*, a process by which the amniotic fluid was analyzed to determine the sex of the fetus. Fetal sex determination became more accessible with the advent of *ultra-sonography*, as this technology was not invasive.

The ease of determining fetal sex has reduced the barriers to preferring sons. For example, a female fetus can be aborted before birth at minimal costs to families. This bias against women is

in addition to a lack of maternal care, which may cause high-maternal mortality. As a result, in multiple countries worldwide, the population is skewed toward males, as women are *missing*.

Magnitude of the Problem

More than 100 million women were missing in South Asia, West Asia, and North Africa.[13] This article brought global attention to the issue of missing women in certain Asian countries like India and China, but Sen was not the first to observe the difference. Preference for sons was a known phenomenon in India at least a decade earlier, and it was being implemented through sex-selective abortions. A study of abortions in a single hospital in India found that 430 out of 450 identified female foeti were aborted, while only 20 out of 250 male foeti were aborted.[14]

In 2003, Sen again wrote about the problem of missing women.[15] This time, he had identified the process by which the distorted sex ratios were observed: sex-selective abortions. Sen said two opposing forces were acting on the missing women problem. On the one hand, female mortality had fallen due to medical care and nutrition improvements. On the other hand, sex-selective abortions of female fetuses had increased, thereby undoing the gains from the first cause. In this

[13] Sen, "More than 100 Million Women Are Missing."
[14] Ramanamma and Bambawale, "The Mania for Sons: An Analysis of Social Values in South Asia."
[15] Amartya, "Missing Women– Revisited: Reduction In Female Mortality Has Been Counterbalanced By Sex Selective Abortions."

article, the sex ratio of various Indian states was analyzed, and it was found that there was a difference between the various states. Again, Sen could not find a satisfactory explanation for this difference. Explanations like income, literacy, religion, or any other observed cultural preference did not account for this difference.

According to Sen, two prevalent explanations for these missing women were cultural preferences and economic development. However, Sen points out that these do not explain the observed outcomes. Instead, the explanation would require a combination of cultural, economic, and social conditions to explain the problem of missing women.

Since Sen's writing, the problem, and its analysis, has developed into a separate sub-field in demographics called "Missing Women." There are many papers discussing and debating the magnitude of the problem. Ansley J. Coale estimated that the number is not 100 million but lower at around 60 million.[16] In response, Stephan Klasen calculated a number closer to 90 million.[17] Later studies have shown that the problem has grown since Sen's 1990 estimate. The problem is limited to countries with a historical preference for sons, as some post-soviet countries show a distortion in SRB.[18] Since Sen's paper, more detailed research on estimating

[16] Coale, "Excess Female Mortality and the Balance of the Sexes in the Population: An Estimate of the Number of 'Missing Females.'"
[17] Klasen, "'Missing Women' Reconsidered."
[18] Michael et al., "The Mystery of Missing Female Children in the Caucasus: An Analysis of Sex Ratios by Birth Order."

SRB has been carried out by Bongaarts and Guilmoto.[19] The authors calculated that the number of missing women had increased to 126 million in 2010 and predicted that the number would rise to 150 million. The authors also try to disentangle the missing women problem into two components: *excess female deaths* and *missing female births*. Excess female deaths may occur because of a lack of medical care or neglect. This excess death happens after birth, and the authors find that this number has consistently fallen, even in countries with poor sex ratios like India and China. Therefore, the missing women problem is now primarily driven by sex-selective abortions and is evident in the distorted sex ratio at birth reported in the countries.[20]

Measuring the Problem

If more sons survive in a country, then it will show up as excess males in a population. However, measuring the ratio between males and females in the total population may be misleading because other factors may affect this ratio. For example, factors like maternal mortality, as Sen shows, may cause the total population to shift towards excess males without a specific son preference.[21] Similarly, life expectancy differs between males and females and may undermine

[19] Bongaarts and Guilmoto, "How Many More Missing Women? Excess Female Mortality and Prenatal Sex Selection, 1970–2050."
[20] Hesketh and Xing, "Abnormal Sex Ratios in Human Populations: Causes and Consequences."
[21] Amartya, "Missing Women– Revisited: Reduction In Female Mortality Has Been Counterbalanced By Sex Selective Abortions."

the effect of son preference even when it exists in the population. Additionally, total population level sex ratios do not provide information about when son preference arose in a country.

These challenges to measuring son preference can be overcome by SRB as this measure is not affected by other factors, like maternal mortality, that may cause excess female mortality. The ratio of males to females is accepted as fixed at 105 to 100 because this is the most common SRB observed in humans.[22] The only way to distort this SRB is if parents determine the sex of the fetus and then preferentially abort a female fetus. Therefore, distorted SRB is the best measure of son-preference observable.

SRB is a direct measure of son preference, but *measuring* SRB is not trivial and suffers from accuracy issues. This is because many countries do not record all births. Birth records are well recorded in the first world, but many developing countries do not record all births. To solve this recording problem, the UN has developed an estimation of SRB from census and birth records for all countries. The values are arrived at by adjusting for the mortality of the sexes.[23]

Moreover, the measure may now suffer from *Goodhart's Law* as countries with distorted SRB get criticized for having poor SRB. Ukraine has been suspected of manipulating SRB because

[22] Tafuro and Guilmoto, "Skewed Sex Ratios at Birth: A Review of Global Trends."
[23] United Nations, Department of Economic and Social Affairs, Population Division, "World Population Prospects 2022: Data Sources."

the country was receiving bad press.[24] However, SRB of countries, as estimated by the UN, is the best *direct* and available measure of son preference. Therefore, this measure becomes the best available tool to test the model that *land to the tiller* reforms force families to prefer and abort daughters.

Existing Explanations

In contrast to measuring missing women, the literature on *explaining* the cause of this phenomenon has yet to provide a general explanation for why families prefer sons and engage in sex-selective abortions. Even Sen notes that there has been no satisfactory generalized explanation for the problem.[25] Partha Dasgupta suggests that families see children as resources and value children based on their future income.[26] Therefore, families prefer sons in countries that discriminate against women regarding employment opportunities, education, and other fields. Monica Das Gupta et al. explore son preference in China, India, and Korea (Rep.) and suggest that similar family values in these countries explain son preference.[27] They note that

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[24] Lawrence King & Marc Michael, No Country for Young Girls: Market Reforms, Gender Roles, and Pre-Natal Sex Selection in Post-Soviet Ukraine, POLITICAL ECONOMY RESEARCH INSTITUTE WORKING PAPER SERIES (2016).
[25] Amartya, "Missing Women– Revisited: Reduction In Female Mortality Has Been Counterbalanced By Sex Selective Abortions."
[26] Dasgupta, "Population and Resources: An Exploration of Reproductive and Environmental Externalities."
[27] Das Gupta et al., "Why Is Son Preference so Persistent in East and South Asia? A Cross-Country Study of China, India and the Republic of Korea."

urbanization may contribute to the reduction of the problem. Similarly, Georgia, Albania, and Vietnam, according to Christophe Z Guilmoto et al., show a similar distortion of SRB after the availability of pre-natal sex determination technology.[28] In contrast to Das Gupta et al., Guilmoto et al. argue that the disruption to the family structure may contribute to distorted SRB in these countries.[29] Family traditions, according to King and Michael, may not be an explanation for SRB in all cases, as Ukraine is an example that violates this trend.[30] The authors find that Ukraine shows a substantial distortion of SRB after the collapse of the Soviet Union despite the country's absence of any cultural/family preference for sons. A hypothesis offered by the authors is that the transition from communism to capitalism may be a cause for son preference.

India's highly distorted SRB shows variation between its constituent states. India has undergone two large-scale panel surveys of socio-economic indicators and health through the National Family Health Surveys. These differences have created opportunities to explore socio-economic indicators to explain SRB distortions. Perianayagam Arokiasamy & Srinivas Goli show that land-holding and patriarchy may explain the preference for sons by using the NFHS data.[31] The

[28] Guilmoto et al., "How Do Demographic Trends Change? The Onset of Birth Masculinization in Albania, Georgia, and Vietnam 1990–2005."
[29] Guilmoto et al.
[30] King and Michael, "No Country for Young Girls: Market Reforms, Gender Roles, and Pre-Natal Sex Selection in Post-Soviet Ukraine."
[31] Arokiasamy and Goli, "Explaining the Skewed Child Sex Ratio in Rural India: Revisiting the Landholding-Patriarchy Hypothesis."

authors show that SRB slightly improves in landless families in India. This hypothesis is supported by the NFHS survey questions about son preference, as families engaged in agriculture show more propensity to prefer sons.[32]

The problem of son preference through sex-selective abortions has been studied since the 1970s, but there seems to be a lack of a single explanation for the phenomenon. This lack of explanation is not because of attempts. Instead, different authors have come up with different explanations.[33] The explanations in the literature can be broadly grouped into the following: *patriarchy*, *culture*, *economic pressure*, and *fall in fertility*.

Patriarchy

Of the existing explanations, patriarchal values are an intuitive explanation for SRB distortion in countries. Countries with patriarchal values will prefer sons over daughters as society assigns higher value to males. This societal preference may even be translated into legal bias against women in the workplace, inheritance, and other spheres of life. These biases would reduce the earning potential of daughters in a society where families may depend on their children for

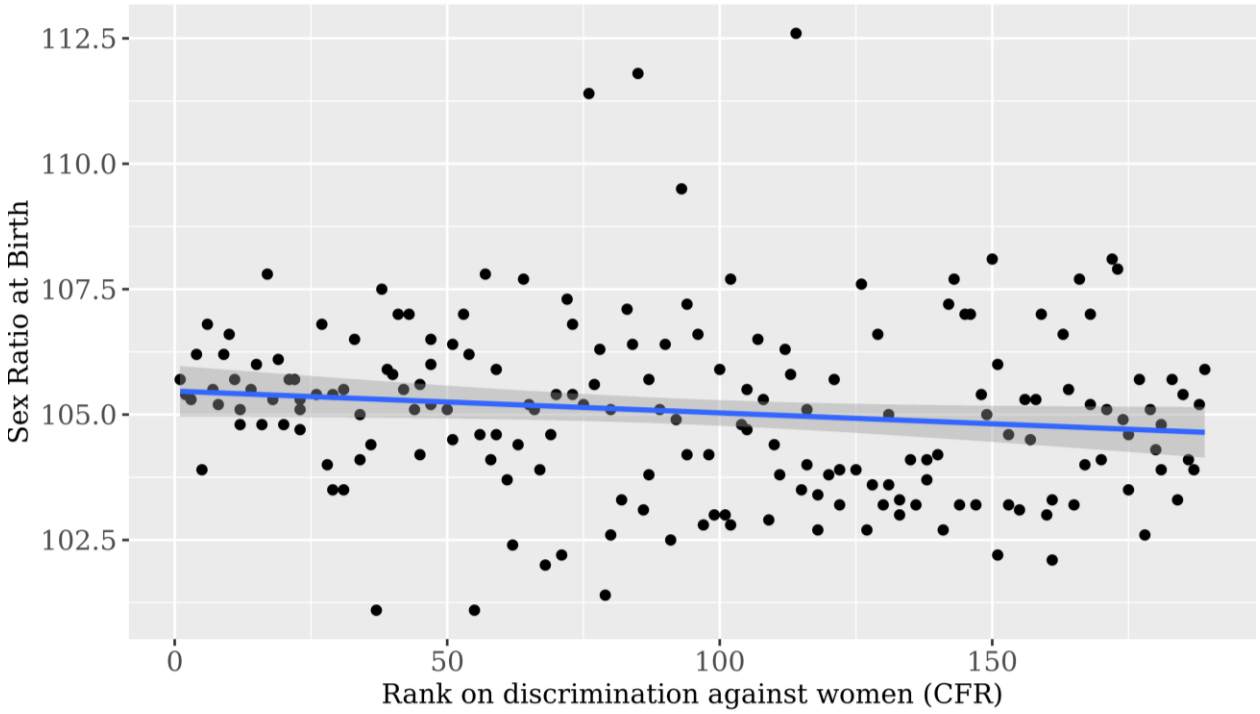
[32] Bharati et al., "Patterns, Determinants and Comparative Account of Son Preferences in India."
[33] Dasgupta and Sharma, "Missing Women: A Review of Underlying Causes and Policy Responses."

income support in old age. Knowing that daughters will earn less, families may prefer to have sons so that their income is higher when the son grows up.

Woojin Chung & Monica Das Gupta argue that this was the reason for the high SRB in South Korea in the 1970s, as the dictatorship enforced patriarchal norms in the law. These biased laws were repealed when South Korea transitioned to democracy.[34] Therefore, the bias against daughters disappeared in Korea in the late 1990s, which normalized the SRB.

[34] Chung and Gupta, "The Decline of Son Preference in South Korea: The Roles of Development and Public Policy."

Figure 3. There is no correlation between countries that discriminate against women and countries that show son preference in SRB.

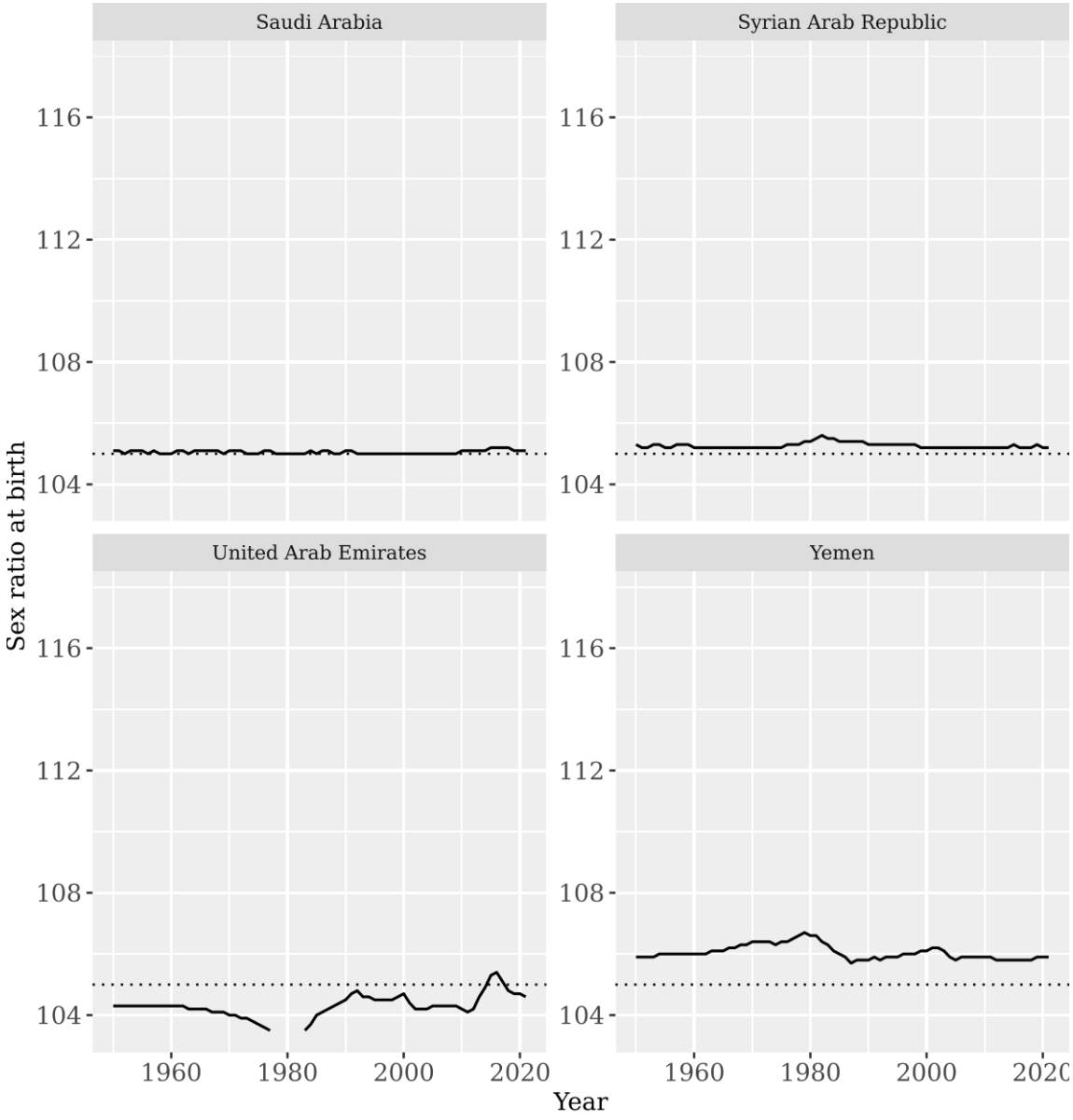


This explanation for son preference may explain the South Korean experience, but it fails when extended to other countries. According to this explanation, countries that formally discriminate against women (socially and legally) should show a distortion in SRB. However, this is not borne out in the observed SRB. The Council for Foreign Relations ranks countries by discrimination against women in the workplace and other legal rights. If patriarchal norms explain son preference, then countries that rank low on *legal* gender equality should show SRB distortions in favor of sons. However, there is no relationship when countries are mapped based on their *legal* discrimination against women, and their SRB (figure 3). However, no *statistically*

significant relationship between the two features is observed.[35]This lack of distortion is not recent, some of the countries that rank high on the Council for Foreign Relations index have not undergone SRB distortion in the past too (figure 4).[36]

[35] 95 percent confidence interval: -0.27 to 0.01, p-value = 0.07.
[36] Council on Foreign Relations, "Women's Workplace Equality Index."

Figure 4. Many countries that discriminate against women at the workplace do not show distorted SRB



Unique Culture

India and China's son preference has been attributed to unique cultural features in the region. This explanation posits that these countries have cultural norms like patrilineality, patrilocality, and religious roles for sons.[37] In these societies, the family name is usually given to the son, while the daughter joins her husband's family and is not considered part of her father's family. Additionally, sons have special religious duties, including funerary rites for their parents. Because of these cultural norms, families benefit from having sons over daughters.

Cultural preferences have been used to explain SRB distortions as the phenomenon is observed in South and East Asian countries. China, India, and the Republic of Korea, according to Das Gupta et al., share similar family structures in these countries.[38] Vietnam was added to the list as it started showing a distorted SRB from the 1990s.[39] Cultural differences within India, according

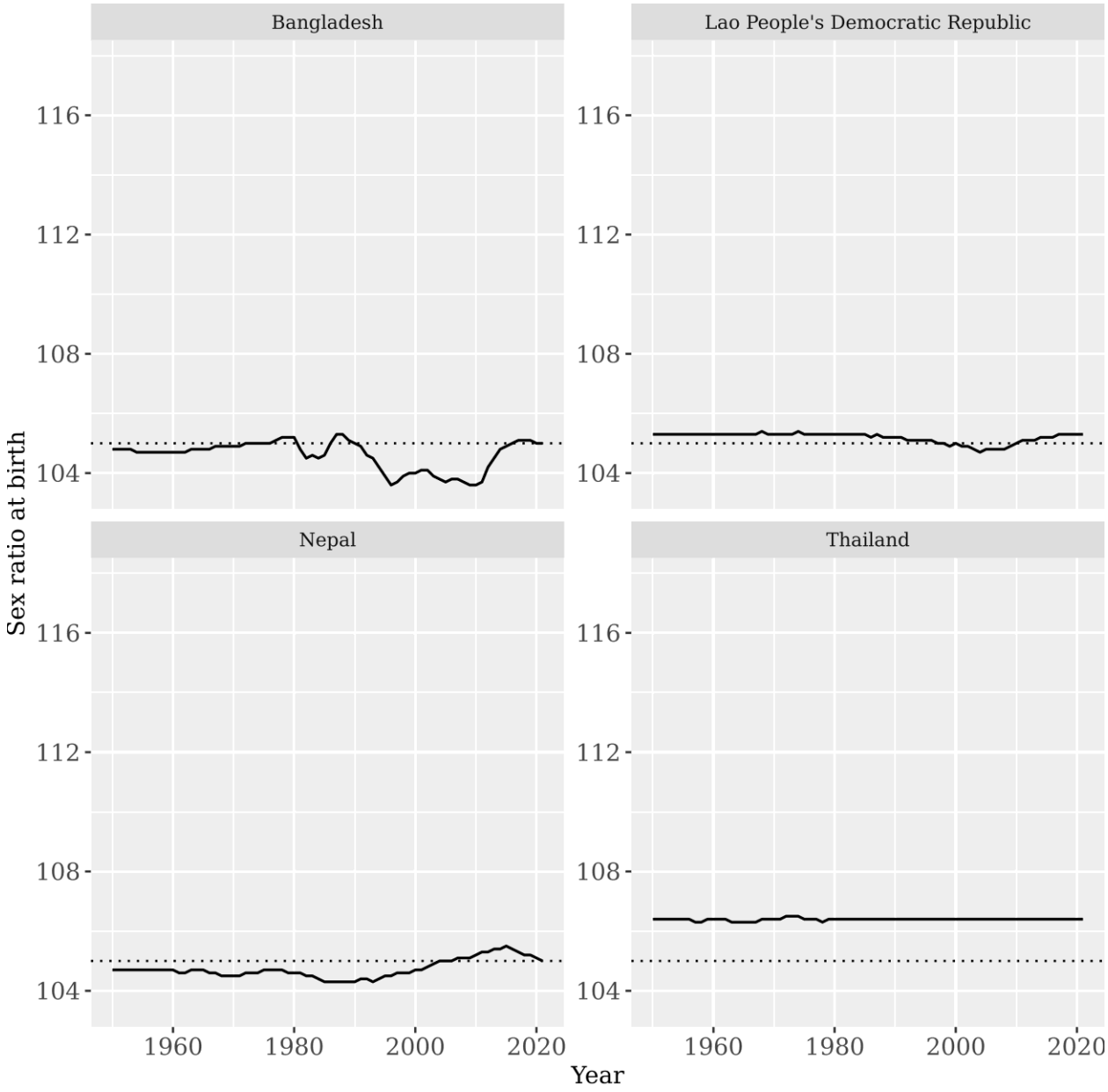
[37] Dasgupta and Sharma, "Missing Women: A Review of Underlying Causes and Policy Responses."
[38] Das Gupta et al., "Why Is Son Preference so Persistent in East and South Asia? A Cross-Country Study of China, India and the Republic of Korea."
[39] Guilmoto et al., "How Do Demographic Trends Change? The Onset of Birth Masculinization in Albania, Georgia, and Vietnam 1990–2005."

to Tim Dyson & Mick Moore, explain the variation in SRB between various Indian states.[40] These cultural preferences may continue even after persons immigrate to another country.[41]

Unique cultural features, like patriarchy, fail to be a generalized explanation for high SRB. Some countries that share culture with China and India do show high SRB, for example, Vietnam, Korea, and Taiwan for China, and Pakistan for India. Figure 5 shows that other countries that share culture distorted-SRB countries do not exhibit similar distortion. Bangladesh and Nepal have cultures similar to India, while Laos and Thailand have cultural similarities with China. However, these countries do not show SRB distortions. Additionally, family values should remain constant over time. However, the data on SRB shows that son preference varies with time, as Korea and Taiwan's SRB distortion predates Vietnam by more than two decades.

[40] Dyson and Moore, "On Kinship Structure, Female Autonomy, and Demographic Behavior in India."
[41] Alesina, Giuliano, and Nunn, "On the Origins of Gender Roles: Women and the Plough."

Figure 5. Many Countries That Share Cultural Values Do Not Show Distorted SRB



The cultural explanation of SRB faces another challenge from the collapse of the Soviet Union. After the Soviet Union collapsed, *some* post-soviet states like Georgia, Armenia, and even

Ukraine showed signs of SRB distortion in favor of sons. These countries do not have any recorded cultural preferences for sons.[42]

Transition to Capitalism

That deviation from natural SRB in post-soviet states also challenges the cultural preference explanation and requires another explanation. A hypothesis has been proposed that the economic stress arising (from the collapse) causes son preference. According to this hypothesis, the collapse of the economy places uneven stress on the income opportunities of the sexes. On the one hand, male-dominated jobs, like agriculture, transportation, and other general physical labor, may continue during economic contraction. On the other hand, jobs for women in the services sector are more affected by the economic stress caused by the transition. Consequently, the perceived economic value of women falls, leading to son preference.

This explanation has been tested in the post-Soviet states. An analysis of 12 post-Soviet-bloc states found that SRB was distorted in only four (Armenia, Azerbaijan, Georgia, and Moldova).[43] However, the authors could not explain the cause of this phenomenon. One explanation is that

[42] Michael et al., "The Mystery of Missing Female Children in the Caucasus: An Analysis of Sex Ratios by Birth Order."
[43] Michael et al.

some former Soviet republics underwent severe economic contraction.[44] King and Michael analyze a similar decline in SRB in Ukraine from a survey that also recorded the socio-economic characteristics of households.[45] From this, the authors conclude that the transition to post-communist capitalism pressures women to abort female foeti because of lesser employment security.

The transition to capitalism hypothesis is attractive to explain the SRB distortion in some of the post-soviet states. However, there are counterexamples on both sides of this hypothesis. The Baltic states and Bulgaria also transitioned to capitalism with the fall of the Soviet Union. Figure 6 shows that despite this transition, they did not experience SRB distortion like other nations in the Soviet bloc. On the other hand, Cuba is yet to transition to capitalism, but it shows a significant decline in female births (figure 7) even before the collapse of the Soviet Union. Even China's SRB started declining much before China transitioned to free markets in the 1990s. China's experience has been contrary to the *transition to capitalism* hypothesis because SRB in China started *improving* in the 2000s after China joined the WTO and integrated with the global trade system.

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[44] Hohmann, Lefèvre, and Garenne, "A Framework for Analyzing Sex-Selective Abortion: The Example of Changing Sex Ratios in Southern Caucasus."
[45] King and Michael, "No Country for Young Girls: Market Reforms, Gender Roles, and Pre-Natal Sex Selection in Post-Soviet Ukraine."

Figure 6. Baltic Countries are also Post Soviet, but do not show distorted SRB.

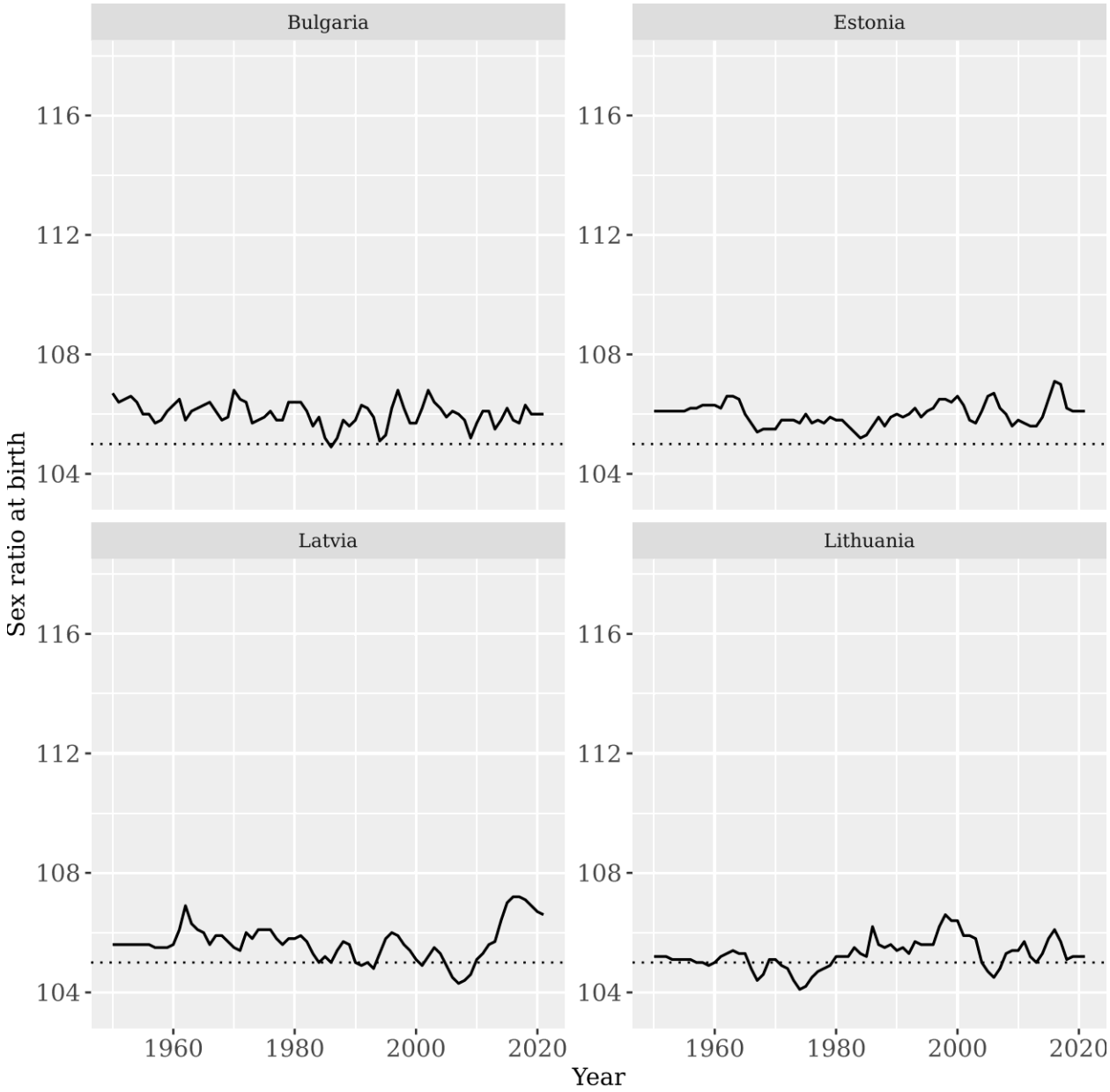
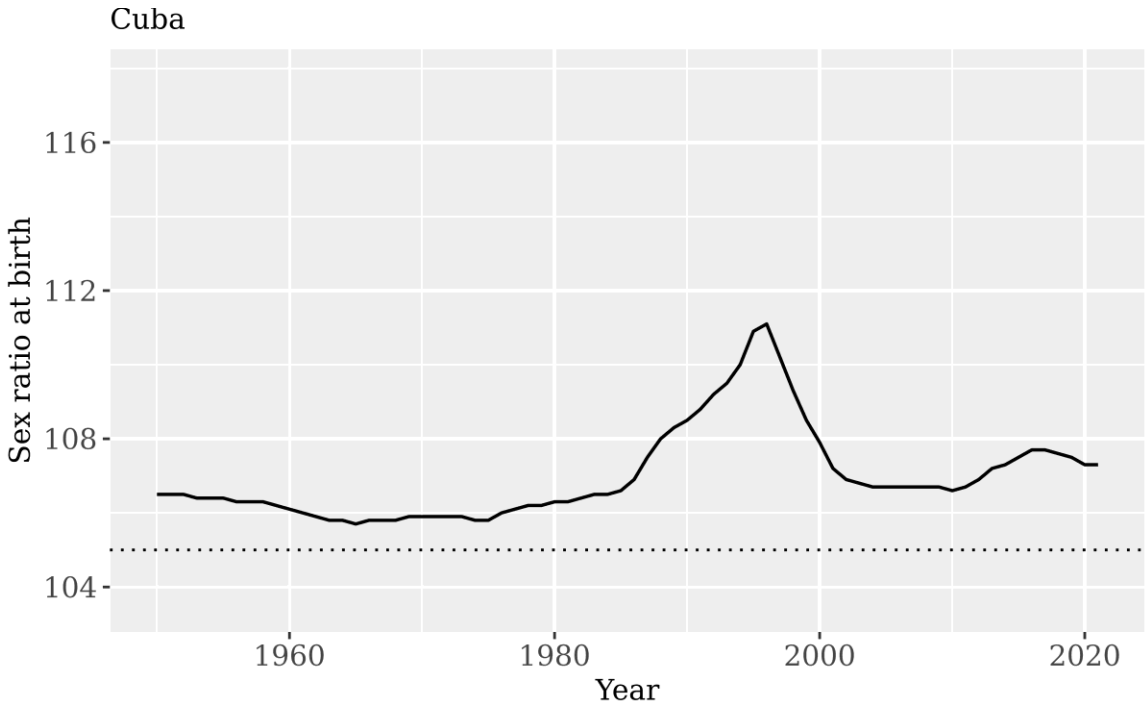


Figure 7. Cuba's SRB Starts Deteriorating From the 1980s without the Country Transitioning to Capitalism



A study tracked SRB distortion in 12 ex-soviet states. It was presumed that increased per-capita GDP may have been a source of this problem, but there was no correlation between the two.[46] The author of the study concludes that there are no satisfactory explanations for this male preference.

[46] Grech, "Secular Trends and Latitude Gradients in Sex Ratios at Birth in the Former Soviet Republics."

Low Fertility

Another popular explanation for son preference has been the pressure from low fertility. According to this idea, families only have a slight preference for *at least one son*. This preference may arise for cultural or religious reasons, like someone carrying on the family name (patrilineality). However, when fertility is high, families do not have to act in any manner because women will have multiple children, increasing the chances of producing *at least one son*. However, when fertility decreases, the choice becomes sharper. Therefore, when parents decide to have only one child, they prefer to ensure that the child is a male.

This explanation is supported by the fact that countries like China and Vietnam underwent a fertility decline at the same time, and their SRB was distorted. China's SRB distortion has been attributed to the One Child Policy.[47] Christophe Z. Guilmoto has offered three reasons: (i) technology, (ii) preference for male births, and (iii) pressure from low fertility to explain Vietnam's recent (relatively) decline of SRB.[48]

However, this theory contradicts the recent improvement in SRB in some states. For example, South Korea and Taiwan have shown a recent trend of improving SRB, accompanied by a marked decline in the total fertility rate. From 1980 to 2020, Korean fertility consistently fell

[47] Loh and Remick, "China's Skewed Sex Ratio and the One-Child Policy."
[48] Guilmoto, "The Sex Ratio Transition in Asia."

from 2.8 to 0.8. However, during the same period, SRB rose from 106.1 to 115 in 1990 and then returned to a relatively normal 105.7 in 2020. Similarly, Indonesia's fertility fell from 4.5 in 1980 to 2.2 in 2020 without any significant change in SRB.

Agriculture

The pressures of an agrarian economy have also been proposed as a reason for son preference. According to this hypothesis, agricultural jobs require more physical strength, so males are more productive in agriculture.[49] Therefore, economies that are predominantly engaged in agriculture would prefer sons. This preference can be exercised efficiently with the advent of pre-natal sex determination technology through sex-selective abortions.

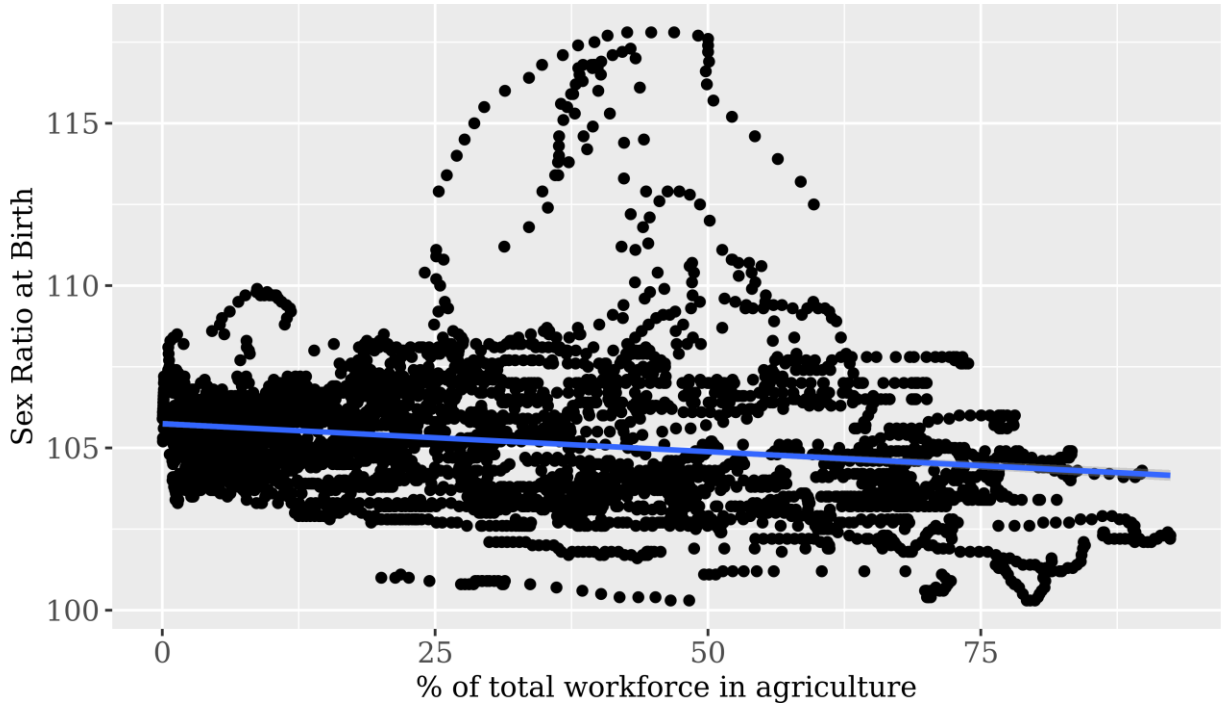
Some literature has identified that agriculture plays a role in son preference. Son preference is positively correlated with farm sizes, where regions with larger average plot sizes.[50] Similarly, families that engage in farming show the strongest son preference in opinion surveys.[51] Even when people immigrate, communities that come from agricultural communities (involving plow agriculture) still exhibit less equal beliefs about gender roles.[52]

[49] Ester, *Woman's Role in Economic Development*.
[50] Arokiasamy and Goli, "Explaining the Skewed Child Sex Ratio in Rural India: Revisiting the Landholding-Patriarchy Hypothesis."
[51] Bharati et al., "Patterns, Determinants and Comparative Account of Son Preferences in India."
[52] Alesina, Giuliano, and Nunn, "On the Origins of Gender Roles: Women and the Plough."

The agricultural explanation seems intuitive to explain SRB distortions in China and India because when these countries started showing sex-selective abortions when these countries were primarily agricultural. However, generalizing this explanation to other countries *shows the opposite result*. SRB (in favor of sons) is *negatively correlated* (-0.245) with the percentage of the working population engaged in agriculture in the last decade (figure 8).[53]

[53] The correlation is statistically significant (p-value = 0.0017).

Figure 8. Agricultural economies do not show SRB in favor of sons.



These socio-cultural mechanisms have not been the only explanation for SRB distortion. The phenomenon has also been attributed to legal changes. For China, a common explanation is the one-child policy. This forced families to have at least one son and undergo sex-selective abortions. However, according to Almond, Li, and Zhang, this may not be the correct legal

intervention.[54] According to the authors, the legal intervention that caused son preference is the de-collectivization of land, called the *household responsibility system*. Under this reform, farmers were given individual plots, and state collective farms were shut down. However, the authors are unable to provide a mechanism showing how son preference is an outcome of land reforms.[55]

Land to the Tiller Reforms

The multiple causes proposed in the existing literature can be substituted by a single reasoning that provides a global solution to the question, *`What motivates families to prefer sons?'* The answer is a type of land reform called *land to the tiller*. These reforms are implemented by countries redistributing land to farmers. Under *land to the tiller reforms*, countries place multiple restrictions on the beneficiaries of land redistribution. These restrictions are usually placed to prevent the re-concentration of land in a few hands. However, these restrictions have an *unintended consequence*, as farming families with only daughters stand to lose possession of the redistributed land. Therefore, farming families prefer sons over daughters and attempt to produce

[54] Almond, Li, and Zhang, "Land Reform and Sex Selection in China."
[55] Almond, Li, and Zhang, *Id.* test an explanation called the *productive sons* explanation which posits higher wages for sons in some agricultural activities. However, the results are negative, and the authors provide five hypotheses for future studies.

at least one son to ensure that they can continue farming under the legal requirements of the *land to the tiller* reforms.

The Theory

To understand how *land to the tiller* reforms forces farming families to prefer sons, an analysis of the legal restrictions placed on the beneficiaries of the reforms is necessary. These reforms generally transfer land to farmers who are personally tilling the land. Interestingly, this land transfer to tillers can happen in two ways depending upon the state of land relations in the country. On the one hand, in some countries, farmers are given land after expropriating landlords who had extensive holdings or did not personally cultivate the land. Examples of such countries are India, Taiwan, and Korea. On the other hand, some countries implement *land to the tiller* reforms as a way of *undoing* farm collectivization where state corporations and cooperatives had previously owned land. Examples include China, the former Soviet States, Vietnam, and Cuba.

In both groups of countries, some governments have worried about the *land to the tiller* reforms being reversed. For example, reforms can reverse if the former landlords repurchase the land from the beneficiaries of redistribution. Additionally, governments have been afraid of the farmers changing land use from agriculture to residential or commercial. Therefore, in most countries, governments have coupled *land to the tiller* reforms with restrictions on beneficiaries' freedom to use the redistributed land. Three types of these restrictions can force families (who benefit from redistribution) to prefer sons. The three categories of restrictions are *transfer restrictions*, *personal cultivation requirement*, and *use restrictions*.

Under the first category (*transfer restrictions*), farmers are prohibited from transferring land to any other person. In some cases, the prohibition may be temporary and end after a few years or after the farmer has paid some installments to the government. In other cases, the prohibition may be indefinite, and the farmer, or their heirs, can never sell the land. These prohibitions also include plugs to prevent *indirect transfers* where farmers cannot lease or sub-lease their land. In some cases, the farmers may not have the right to transfer the land in the first place. Countries like China and India did not give property rights to the beneficiaries of land redistribution. Instead, the farmers became tenants, and the state still held title to the land. In such cases, the farmers do not have the right to transfer their land because they do not own it.

In addition to *transfer restrictions*, land reform laws require farmers to personally cultivate the land (*personal cultivation requirements*). Under these requirements, a farmer cannot get someone else to farm on their land. Some laws prevent sharecropping, where the farmer gives the land to another for a crop share. Other laws may even prohibit farmers from hiring wage laborers to help cultivate. For example, farmers may only employ family members to cultivate the plot.

The final group of restrictions (*use restrictions*) prevents the farmer from changing the purpose of the land. Again, like the previous restrictions, the restrictions may vary. In most cases, the farmer cannot change the land from agricultural land to commercial or residential land. The legal system sometimes requires the farmer to grow a specific crop and then hand over a pre-determined share to the government as taxes or lease payments.

Usually, violation of any of these restrictions results in the state expropriating the land from the tiller, leaving the farmer's family without any land to cultivate.

The Mechanism

In this restricted framework, a farming family with only daughters faces a complete loss of income when the first generation becomes too old to farm. An analysis of the choices of such a family demonstrates how the land reforms lead to son preference. The choice to sell land and retire is not available in such a family because farmers are restricted by *transfer restrictions* from cashing out the equity in their land. Additionally, the same restrictions on land transfers and expropriation of landlords also restrict the pool of buyers. Instead of selling, the family cannot lease the land to another person and live off the rental income as *transfer restrictions* usually prohibit leasing.

In some countries, farmers can hire laborers to help them farm. However, this may not be a feasible option for daughter-only families. Farming is notoriously hard to monitor, as collective farms have shown us. Therefore, the farmer cannot monitor if the employees are putting in adequate effort or care. Additionally, the farmer has to come up with wages throughout the season to recover his costs after the harvest. The problems of monitoring and harvest price volatility can be solved in a market system by the farmer entering into *share cropping agreements* where the employees are paid a share of the crop at the end of the season. However, farmers are usually prohibited from paying their employees a share of the crops because that would constitute sharecropping, which is prohibited under *personal cultivation requirements*.

An apparent solution for farming families with daughters may be to get their son-in-law to cultivate their land. However, a closer analysis of the laws shows that this is also not feasible in a *land to the tiller* legal system. Even if the son-in-law moves to cultivate the beneficiary's land, the beneficiary is at risk of expropriation because the family violates the *land to the tiller* laws. Most *land to the tiller* laws allow the family to work on the land, but the laws usually define family as a husband-wife pair with their children but do not include in-laws. Therefore, the family may be expropriated for violating the *personal cultivation requirements*. The *personal cultivation requirements* also prohibit the father of a daughter and his son-in-law from entering into agreements that could benefit both parties. Logically, the parties can enter an agreement where the father-in-law promises to bequeath the land to the son-in-law after his death. In return, the son-in-law promises to care for his in-laws in old age. However, the *land to the tiller* laws create situations where parties cannot depend on this agreement. In some situations, the son-in-law may complain to the authorities that his father-in-law is not personally cultivating the land and, therefore, should be expropriated. The expropriation will most likely benefit the son-in-law, who can claim to be the tenant. This expropriation would free the son-in-law from the obligation to support his in-laws (beneficiaries) in their old age.

Similarly, since the son-in-law is not a family member, he may violate the law prohibiting *personal cultivation*. This places also places the son-in-law at risk of eviction by his in-laws. These arrangements could only work if the parties have other methods of ensuring commitment to their promises. For potential sons-in-law, the reforms create pressure against moving. If the son-in-law moves, he cannot personally cultivate his father's land; therefore, the son-in-law's

father risks losing his land under the same requirement. Additionally, the land reforms cause a dearth of landless sons because many (if not all) families get land from the state.

Even when legal systems are weak, *land to the tiller* systems may be well enforced through incentives. The legal restrictions are imposed with the threat of dispossession where, if the new owner violates these conditions, the land may be taken back from them and redistributed again. This threat of dispossession has a self-enforcing feature that is rare in legal systems. Other beneficiaries, landless persons, or the original owners who were dispossessed by the state in the region have the incentive to report violations since the violator's land will be taken away and redistributed. The expropriation brings in more land for redistribution and increases the chances of the neighbors of the violator getting land that was expropriated. Therefore, such restrictions may be well implemented even if the legal restrictions in the country are weak.

The pressure from *land to the tiller* reforms alone is not enough to distort SRB, as parents will need technology to determine the sex of the fetus. This technology became available with amniocentesis in the early 1970s, followed by the now prevalent ultra-sonograph from the 1980s. However, without these technologies, parents of farming families may be forced to resort to female infanticide. Another strategy may be for parents to beget *excess girl* children to produce *one* son and then neglect the girl child and expend more resources to ensure the son survives.

The Exemplars – India and China

Most sex-selective abortions occur in India and China; consequently, both countries account for most of the missing female births worldwide.[56] In line with the theory, both countries have implemented *land to the tiller* reforms, but the pathways and periods of the land reforms differ. On the one hand, India's land reforms were implemented right after independence to abolish *zamindari*, a feudal landlord system. On the other hand, China's government implemented *land to the tiller* systems as a *reform* of the collectivization systems in 1978. However, both systems ended with similar laws after their respective reforms. Consequently, the reforms created similar incentives/pressure for farming families.

India

Son preference in India has been observed and studied since the 1970s.[57] This bias is usually attributed to cultural preferences and entrenched patriarchy in India. However, India carried out an extensive *land to the tiller* program during the same period. For example, India's largest state, Uttar Pradesh, imposed a land ceiling and *land to the tiller* law in 1960. These laws differed from the reforms in China because, unlike China (later in 1978), agricultural land was not held in

[56] Chao et al., "Systematic Assessment of the Sex Ratio at Birth for All Countries and Estimation of National Imbalances and Regional Reference Levels."
[57] Ramanamma and Bambawale, "The Mania for Sons: An Analysis of Social Values in South Asia."

communes, and all farmers were not wholly expropriated. Instead, India's land reforms placed restrictions on farmers who were either owners or tenants of agricultural land.

Indian *land to the tiller* reforms contain all the restrictions that a *land to the tiller* regime imposes. Therefore, the reforms exacerbate the pressures on farming families to produce male heirs. Like China's reforms, Indian farmers did not get *ownership* of land that was redistributed. Instead, they became tenants on the land, and the state kept ownership. As a consequence, Indian farmers could not sell their land. In contrast, countries like Korea and Taiwan (in the initial period) allowed land reform beneficiaries to sell their land. Farmers are also prohibited from leasing their land in the Indian State of Uttar Pradesh.[58]

Indian agricultural families are under further pressure to produce sons due to another set of restrictions called *land ceiling*. For example, the Indian state of Punjab prohibits families from owning more than a specified amount of land.[59] These restrictions limit a farmer's land area (either as a tenant or a farmer). However, this land ceiling was not calculated on a *per-capita basis* but on a *per-family basis*. This limit on holding land per family requires the state to define a *family* which these legislation define as a husband-wife couple and their minor children. Under this definition, any farmer who can produce more sons can acquire more land in the name of

[58] Uttar Pradesh, India, Uttar Pradesh Zamindari Abolition and Land Reforms Act, 1950.
[59] Punjab, India, Punjab Land Reforms Act, 1972.

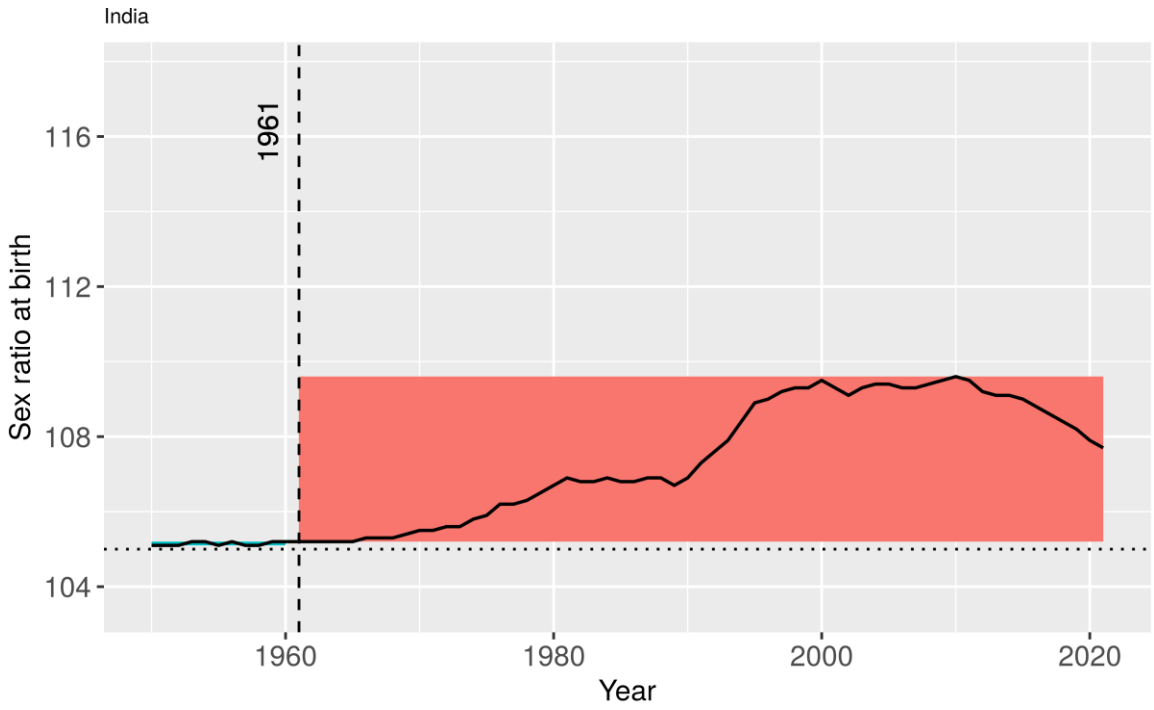
their sons when they reach adulthood. This benefit does not accrue to families with daughters because Indian society practices *patrilocality*, where a woman joins her husband's household, and sons usually stay with or near their fathers.

In addition to *land ceilings*, Indian land reform laws further encouraged son preference by explicitly dis-inheriting daughters of tenant farmers.[60] These laws were designed to prevent excessive fragmentation of land over generations but further encourage families to resort to sex-selective SRB.

The SRB decline in India happened in the 1970s (figure 9), and the lack of technology can explain this delay in determining fetal sex. This technology became available in India in the 1970s, and that explains the slight delay between the implementation of land reforms and sex-selective abortions.[61]

[60] Punjab (India), PEPSU Tenancy and Agricultural Lands Act, 1955.
[61] Jeffery, Jeffery, and Lyon, "Female Infanticide and Amniocentesis."

Figure 9. India's sex ratio decline accelerates with access to technology**.**



The pressure on farmers due to *land to the tiller* reforms correlates with this literature and explains the mechanism for son preference in India.

Unlike India, Bangladesh implemented a different type of land reform. Like its South Asian neighbors, Bangladesh regulated the relationship between landowners and tenants in 1984.[62] However, the tenants were not permanently frozen in their tenancies, unlike in Pakistan and

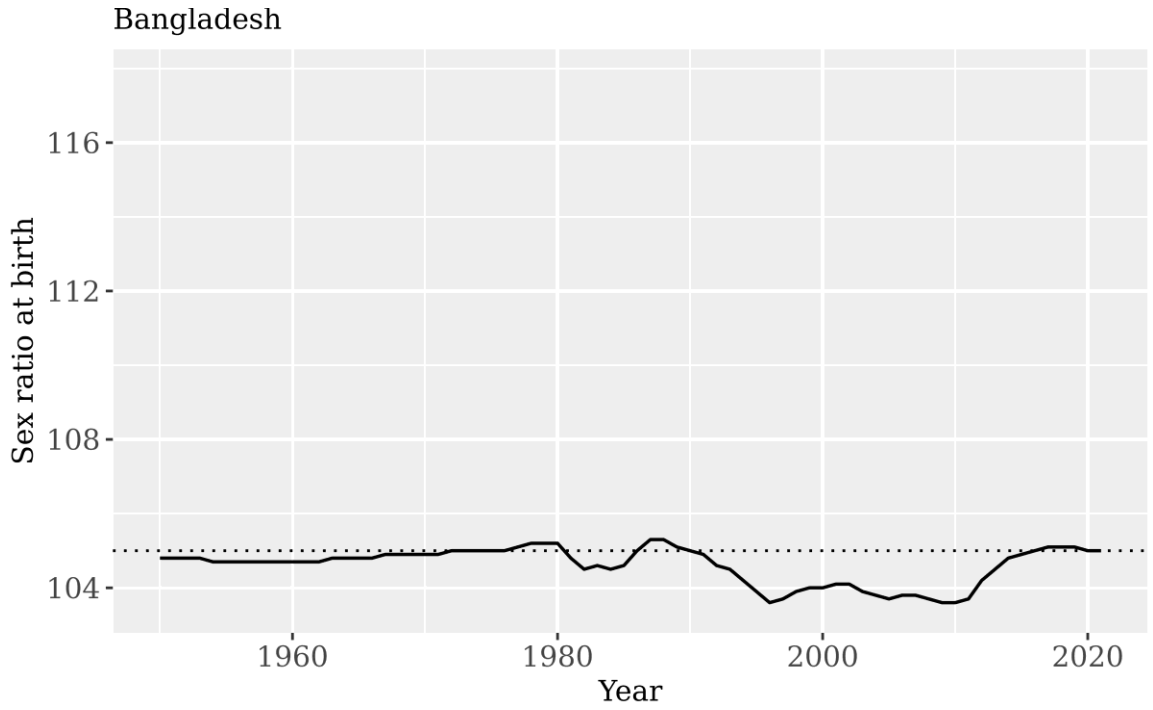
[62] Bangladesh, The Land Reforms Ordinance, 1984.

India. The law regulated rents that the tenants were required to pay, but the tenancy contracts were limited to five years.[63] This difference in tenure reduces the incentive/pressure on a tenant farmer to produce a son.

In contrast, Pakistan's and India's agricultural tenancies are inheritable rights; therefore, they lapse if no heirs are to cultivate the land. In contrast, Bangladeshi tenants have a five-year cap, after which the tenancy is extinguished. In such a system, the farmer is still pressured to produce a male heir, but compared to India, it will be less. In congruence with this prediction, unlike India, there is no increase in SRB in Bangladesh over this period (figure 10).

[63] Bangladesh.

Figure 10. Bangladesh's SRB is not affected as India's.



China

Like India, China's son preference in China is well studied, and, till recently, this decline was attributed to the *one-child policy* that restricted parents to one child. However, China's sex-ratio decline tracks the transition from collective farms to the *Household Responsibility System*

farming in the late 1970s and not the implementation of the one-child policy.[64] However, the authors could not provide a satisfactory explanation for the mechanism for this change.

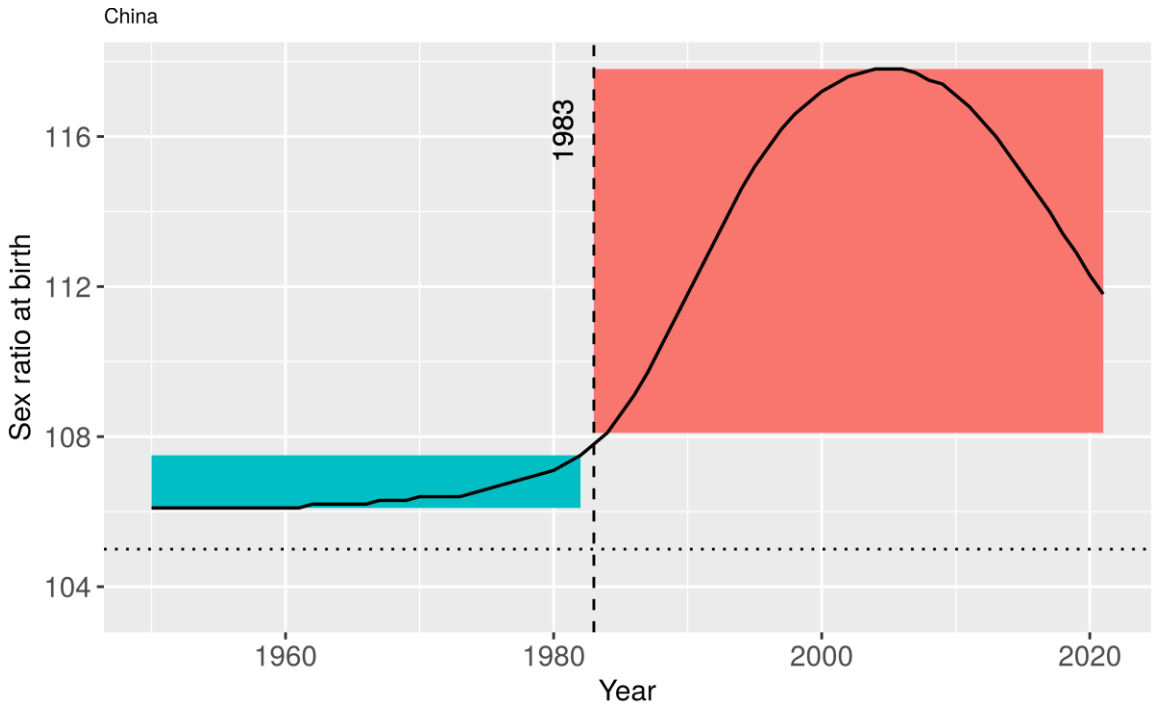
The change in SRB and its relationship with land reforms can be explained by analyzing the history of land reform rules in China. In line with communist ideology, China engaged in a massive land collectivization program after the Communist Party of China came to power under Chairman Mao in the late 1940s. This collectivization led to a reduction in agricultural production, and by the late 1970s, the collectives were under increasing pressure to meet production quotas. In 1975, the management of one collective farm abandoned the collective farm system as it realized it would not be able to meet the targeted production. Instead, households were allotted part of the collective farm, and each household was responsible for meeting a production target.[65] This system was a departure from the cooperative system, where each person was responsible for a specific job and paid based on labor inputs.[66] Instead, the new system was a *land to the tiller* system where the farmer paid a percentage of the crops produced to meet the quota of the collective farm. The farmer could keep the surplus to consume or sell. The system was labeled the *household responsibility system*.

[64] Almond, Li, and Zhang, "Land Reform and Sex Selection in China."
[65] Li, *Transformation of the Law on Farmland Transfer in China*.
[66] Crook and Crook, "Payment Systems Used in Collective Farms in the Soviet Union and China."

This arrangement (*household responsibility*) violated the existing laws on collectivization. However, by 1979, the government realized the system's benefits and started adopting the *household responsibility system* across China.[67] By 1983, this new agricultural production system had become the default in China. The Chinese system is the same as a *land to the tiller system*, just with a different name, so all the pressures of the *land to the tiller* system operate on Chinese farming families. Consequently, a contemporaneous SRB distortion is observed in China (figure 11).

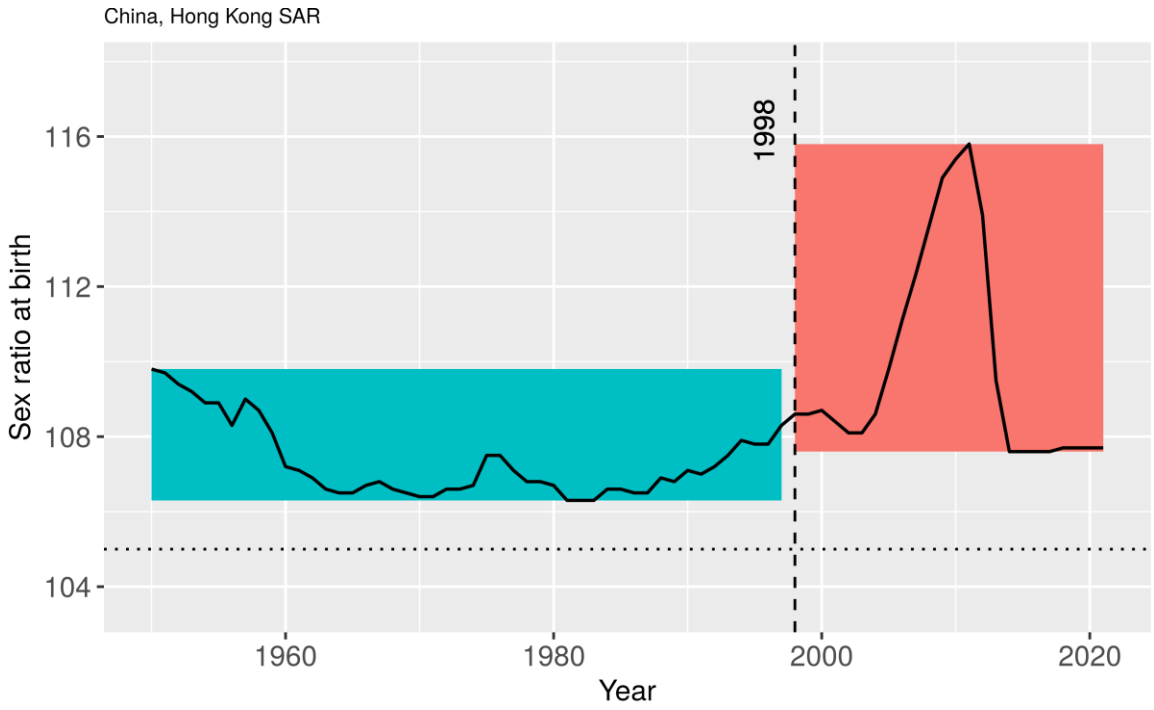
[67] Lin, "The Household Responsibility System in China's Agricultural Reform: A Theoretical and Empirical Study."

Figure 11. China's SRB decline is aligned with land reforms and not the One Child Policy.



In contrast to mainland China, Hong Kong does not experience SRB distortion in the late 1970s. During this time, Hong Kong was part of the British Empire, and the residents of Hong Kong were not affected by laws in China. However, this changed in 1997 as Hong Kong was returned to China. This transfer allowed Chinese citizens from mainland China to migrate to Hong Kong more freely than before. The migrants from mainland China may have parents with agricultural land back in mainland China. Therefore, the families would still face pressure in producing sons, as the sons would be able to maintain control over agricultural land back on the mainland. Consequently, SRB in Hong Kong distorts after the island joins the mainland (figure 12).

Figure 12. Hong Kong's SRB distortion tracks the territory's return to the mainland.



East Asian Land Reforms

In addition to China, three other countries show distorted SRB: South Korea, Taiwan, and Vietnam. For these countries, cultural similarities with China are used to explain the decline in SRB. However, this explanation ignores countries like Thailand, which shares a cultural heritage with China, but do not show son preference in SRB. East Asia is also interesting because the two countries seem to have solved the problem, as South Korea and Taiwan have SRBs that have reverted to normal (or close enough to normal). This reversion has been attributed to increased rights and opportunities for women, but such explanations cannot explain the increase in male births in the first place.

Instead of the existing explanations, land reforms are a better explanation for the phenomenon of son preference in these countries. The proposed model is superior to existing models for three reasons. First, it explains differing SRB in countries with similar cultural and social backgrounds. Second, it explains why SRB distortion arises at different points in time in these countries (Vietnam's SRB distortion starts much later than others).

Son preference in South Korea is also reflected in its SRB distortion. However, unlike most other countries, South Korean SRB has trended *back* towards the natural ratio after it peaked in the 1990s. This increase in SRB, and its eventual decline, can be explained by the agricultural land policies of the Republic of Korea.

At the end of WWII, Japanese companies and Korean individuals owned large tracts of agricultural land. This concentrated ownership was seen as a problem by the US occupation government for two reasons. First, Japanese ownership had to end as Korea was to become an independent nation. Second, the US feared that large landless populations might participate in a communist overthrow of the South Korean government. Therefore, the US government started a process of *land to the tiller* reform that the Korean government carried on. After much political negotiation, land reforms started in the 1950s by limiting the land a family could own to three hectares through the Land Reform Act of 1949. The excess land holding had to be sold to the government at below-market prices. In turn, the government sold the land to landless tenant farmers with generous, long payment terms.

In contrast with China and India, the beneficiary of land reform (the tiller) could sell their land to whomever they pleased; after the tiller had paid the government.[68] Land leasing was also banned under the 1949 law. However, it seems the leasing prohibition was not enforced.[69] As Korea industrialized and urbanized, farmers would use their land to move to other jobs or sell their land to be converted for other uses. These legal lacunae led to the establishment of a robust land market in South Korea.

However, this land market stopped in 1972 as the government became worried about two trends: the fall in land area under cultivation and the growth of tenant farmers. In 1972, the Korean government legislated the Farmland Preservation and Utilization Act, that restricted the conversion of agricultural land.[70] From then on, a farmer had to get permission from the government and pay a fee if the farmer wanted to convert agricultural land to any other use. The government also launched a campaign to check the illegal leasing of agricultural land.[71] It seems to have been partially effective as fully tenanted farms fell from 6.5% in 1977 to 1.8% in 1982.[72]

As expected, the restrictions in 1972 created a type of *land to the tiller* system. In turn, agricultural families are *forced* to prefer sons to maintain themselves in old age. Before 1972 a

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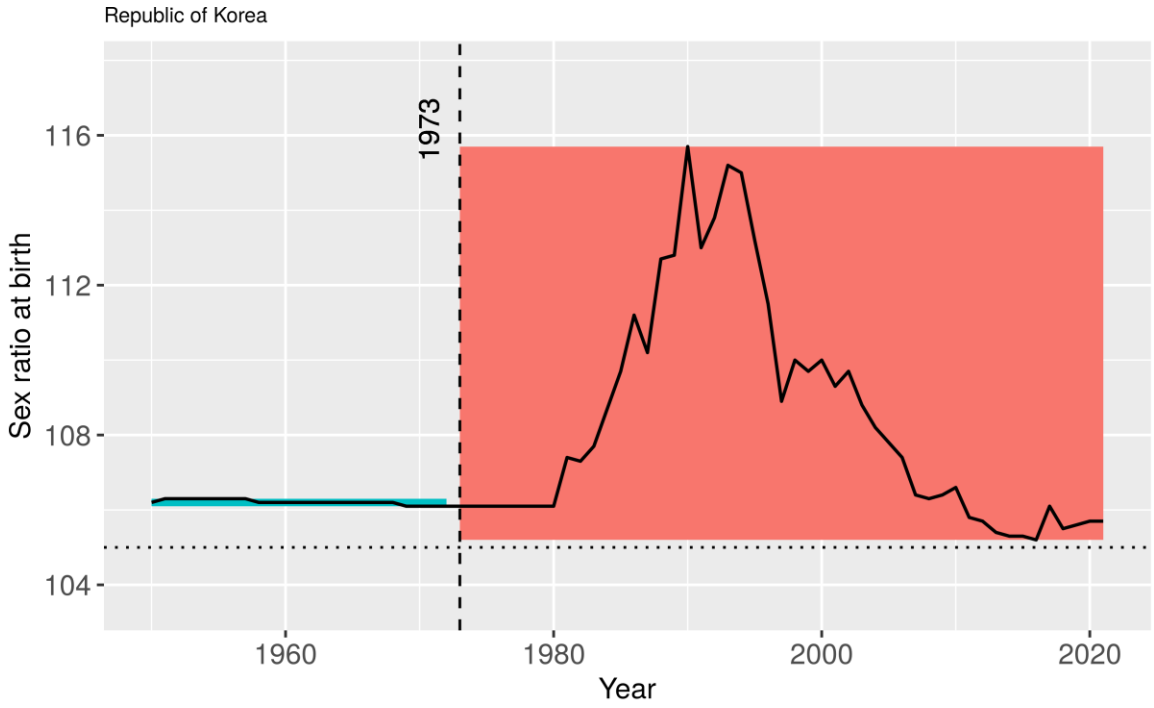
[68] Shin, "LAND REFORM IN KOREA, 1950."
[69] Wood-Keun, "An Economic Analysis of Farmland Leasing System in Korea."
[70] Im, "Farmland Policies of Korea."
[71] Institute, "Agriculture in Korea 2020."
[72] Wood-Keun, "An Economic Analysis of Farmland Leasing System in Korea."

Korean farmer with daughters could sell their land after they had grown too old to farm the land. The land would also bring better prices because it could be used for industrial, commercial, and residential purposes. Alternatively, they could use the illegal (but ignored) land leasing market to obtain an income to support themselves in old age. However, after the 1972 legislation, both of these routes are shut. Even if a sale was possible, the price would be lower because the land could only be used for agriculture. The only route left for the farmer in old age was to *beget a son* who would take over tilling of the land and support his father in old age. In line with this explanation, the SRB of South Korea shows a rapid increase around the same time that these reforms are enacted and start getting implemented (figure 13). This explanation is also supported by more detailed studies of Korean son preference. As predicted by the *land to the tiller* theory, rural areas have a worse sex ratio than urban areas.[73] Similarly, Doo-Sub Kim expected to find more sons in Urban areas due to better access to medical technologies and class consciousness.[74] However, the author found that the sex ratio was actually worse in rural areas.

[73] Park and Cho, "Consequences of Son Preference in a Low-Fertility Society: Imbalance of the Sex Ratio at Birth in Korea."
[74] Kim, "The Pattern of Changing Trends and the Regional Differences in the Sex Ratio at Birth: Evidence from Korea and Jilin Province, China."

Figure 13. Korea's SRB deteriorates as Korea prohibits sale of agricultural land for any other Purpose.



Taiwan follows the same trajectory as South Korea on son preference observed through distorted SRB. Like Korea, Taiwan was a Japanese colony until the end of WWII when. However, unlike South Korea, the KMT government took power in Taiwan. The KMT government faced the same risks of a communist uprising and took similar steps to preempt discontent by enacting legislation to protect farmers. These legal reforms received technical support from the US

government and are similar to those enacted in Korea and Japan.[75] The reforms started with regulating rents and protecting tenants from evictions through the Rent Reduction Act of 1949. This reform was followed by the eponymous land to the Tiller Act in 1953.

Taiwan's land reforms initially diverged from the Chinese and Indian law reforms in ways that would reduce the son preference laws. Like Indian tenancy protection laws, landlords could not evict tenants unless the tenants personally stopped cultivating the land.[76] However, unlike Indian laws, the landlord could force the tenant to leave by paying the tenant one-third of the value of the land.[77] This provision is missing in Indian and Chinese law. Similarly, Taiwan's 1953 *land to the tiller* legislation also differs from India and China. Unlike India, in Taiwan, a beneficiary of land redistribution was allowed to sell his land after the beneficiary had paid the government.[78]

These features of the Taiwanese legal system created safety valves against the pressure to produce sons. As an illustration, a tenant farmer with daughters could negotiate with the landlord to leave the land for one-third the value of the land. As Taiwan rapidly industrialized and land

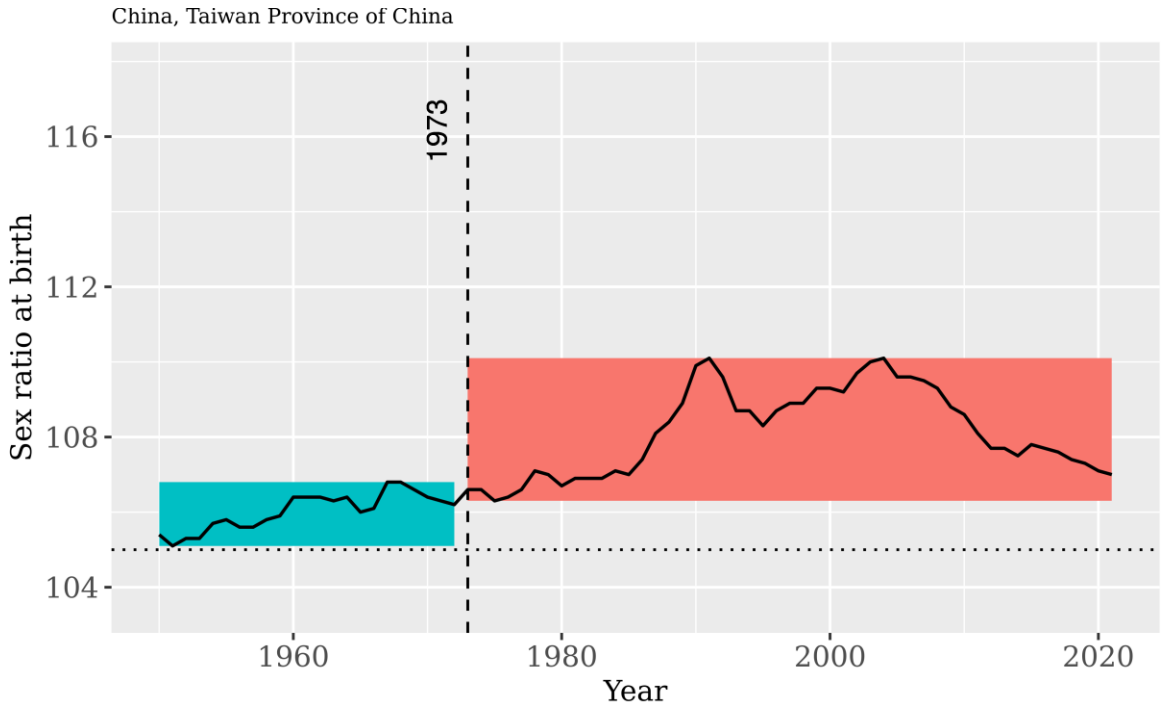
[75] Min-Hua Chiang, The US Aid and Taiwan's Post-War Economic Development, 1951-1965, 13 AFRICAN AND ASIAN STUDIES 100 (2014).
[76] Bingyuang, "On Resolving the Problems Entailed by the Rent Reduction Act of Taiwan's Land Reform."
[77] Bingyuang.
[78] Korea, Land to the Tiller Act, 1953.

values increased, this amount became larger.[79] Similarly, farmers who received land through land redistribution under the *land to the tiller* legislation could exit farming by selling land to the rapidly growing residential and industrial sectors.

The option for farmers to exit farming through a sale, or surrender of a lease, was closed in 1973 because of legal changes. These changes were motivated by the government of Taiwan becoming concerned by the rapid expansion of urban, commercial, and industrial land at the expense of agricultural land. To restrict this expansion, the government enacted the Agricultural Development Act in 1973, which restricted the conversion of agricultural land to other uses.[80] With this legal change, the exit option for farmers with daughters is substantially reduced as the price of agricultural land becomes capped due to the restrictions on conversion. This legal change would place Taiwanese farmers in a similar position as Indian and Chinese farmers in the *need to produce a male heir*.

[79] Bingyuang, "On Resolving the Problems Entailed by the Rent Reduction Act of Taiwan's Land Reform."
[80] Shuchen Cheng, "Losing Farmland, Taiwan Seeks to Limit Development."

Figure 14. Taiwan mirrors Korea in SRB increase and then decline.



This legal history explains the rise and decline of male births observed in Taiwan (figure 14). Son preference would have arisen when Taiwan implemented *land to the tiller* programs and redistributed land. However, the pressure on farm families would have been lesser than in India because Taiwan had two exit routes for farmers without sons. However, these exit routes were closed (or made more difficult to access) in 1973. Consequently, A significant rise in male births is observed after 1973. This rise was also possible with the availability of pre-natal sex determination technology (amniocentesis).

Vietnam is part of the Chinese cultural sphere and shows a similar son preference through SRB. However, China's SRB starts deteriorating in the late 1970s (figure 11), but Vietnam does not show the same phenomena till the late 1990s (figure 15). Cultural preference does not explain this difference in time for SRB deterioration.

On the other hand, this difference in time is explained by *land to the tiller* reforms pressuring the families to produce male heirs. According to Prabhu L. Pingali & Vo-Tong Xuan, Vietnam, like China, ended up with a *land to the tiller* system due to the failure of collective farming.[81] Vietnam's history of land reforms follow a trajectory similar to China, but delayed in time.[82] After 1975, collective farming became the official method of agricultural production as Communist North Vietnam took control of the entire country.[83] But declining yields led to Vietnam abandoning the system by 1988 when the country shifted to the *household responsibility system* as developed in China.[84] This household responsibility system was further liberalized by a 1993 law that allowed the pledging and sale of agricultural land. Critically, for the first time, land became inheritable in Vietnam.[85] However, these rights were conditional on the household using the land for the same purpose as it was allocated. Under the 1993 law, the government can take away the land of a household if the household changed the use of land, say from agricultural to industrial.[86]

The 1993 land law forces Vietnamese farmers to produce male heirs as the farmers' position is similar to that of South Korean and Taiwanese farmers. However, unlike the latter two countries,

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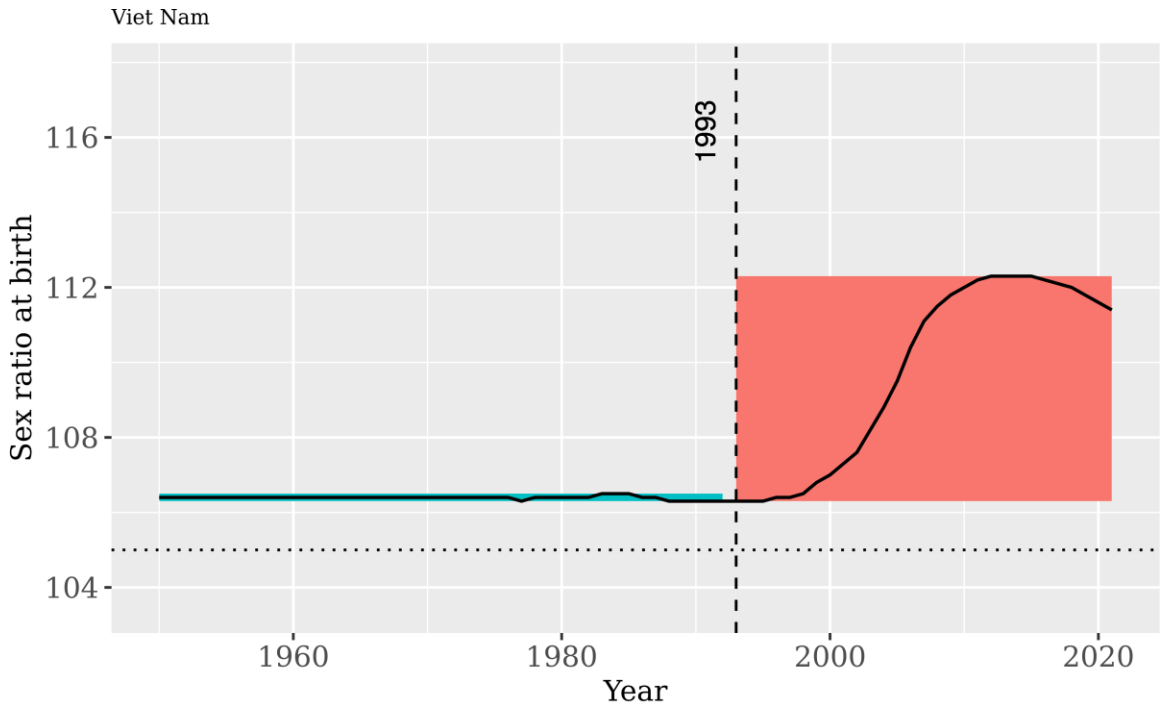
[81] Pingali and Xuan, "Vietnam."
[82] Do and Iyer, "Land Titling and Rural Transition in Vietnam."
[83] Pingali and Xuan, "Vietnam."
[84] Resolution 10 of 1988.
[85] Vietnam, Law on Land.
[86] Vietnam.

Vietnam has yet to undertake the undoing of *land to the tiller* systems. Consequently, following the theory, Vietnam shows (figure 15) signs of systemic sex-selective abortions to favor sons after land reforms.

Figure 15. Vietnam shows SRB distortion like China but is delayed by two decades.

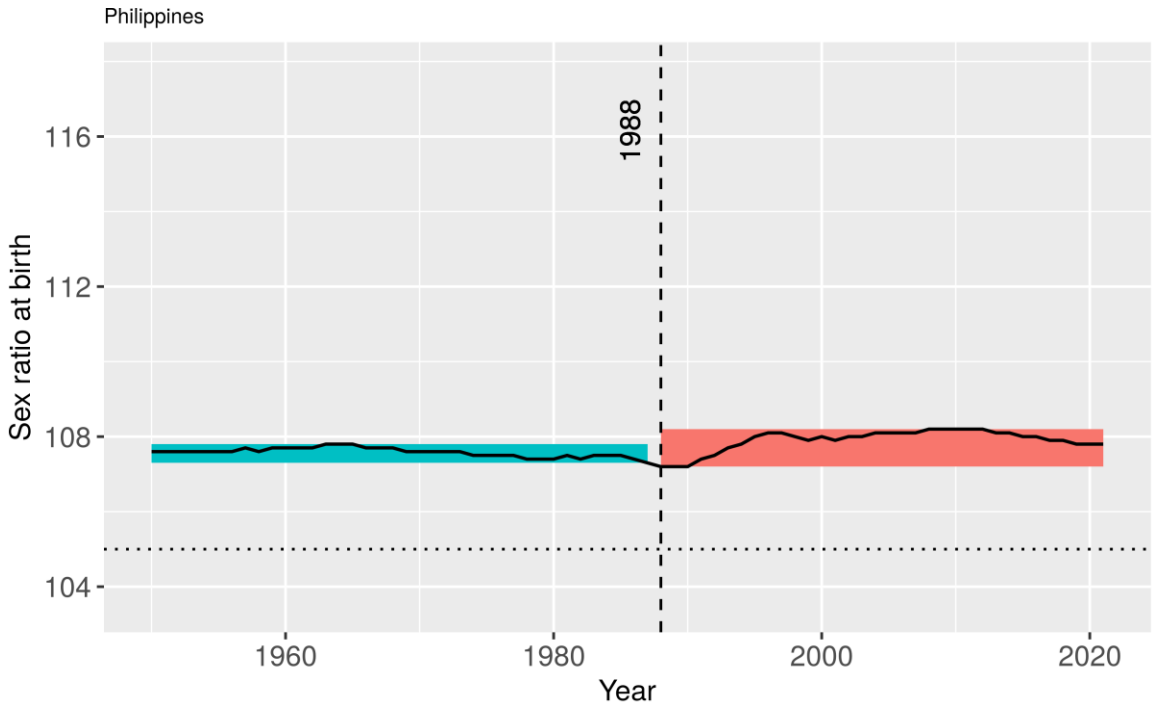


South of the East Asian countries, the Philippines has not attracted the attention of the *missing women* literature. The Philippines implemented *land to the tiller* reforms for the first time through the *Comprehensive Agrarian Reform Program* in 1988. Like other *land to the tiller* laws, beneficiaries were not allowed to sell the land they received from redistribution.[87] However, this

[87] Borras, "State Society Relations in Land Reform Implementation in the Philippines."

restriction was limited to ten years. A small but noticeable change in SRB was observed in the country after the land reform law was implemented (figure 16).

Figure 16. Philippines shows SRB decline after land reforms.



A Natural Experiment – The Soviet Union

The collapse of the Soviet Union has led to some countries showing son preference in SRB. The collapse creates a natural experiment because, unlike East and South Asia, countries in this region do not have any historical preference for sons. For example, Ukraine, according to King and Michael, had no historical preference for sons, but the population started sex-selective

abortions after the fall of the Soviet Union.[88] Similarly, religion does not explain SRB distortions in this region.[89]

Another prevailing explanation for SRB is the access to technology coupled with declining fertility that forces families to prefer sons. This explanation also fails for the countries in the former Soviet sphere, as these countries had access to sex identification technologies long before SRB started showing distortion in favor of sons. Similarly, these countries' fertility started declining in the 1960s, long before the SRB distortion was observed in the late 1970s and early 1990s.[90]

However, SRB distortion in these countries is in line with the land reforms implemented in these countries. An analysis of the timeline of agricultural land reforms demonstrates this. Like China, the Soviet Union experienced declining agricultural productivity after the collectivization of farms. Like China, by the late 1970s, collective farms were broken up and handed over to families in line with a *land to the tiller* reform. However, this was not implemented universally or across all sectors. Some sectors, like cotton, remained under collective farming because the

[88] King and Michael, "No Country for Young Girls: Market Reforms, Gender Roles, and Pre-Natal Sex Selection in Post-Soviet Ukraine."
[89] Duthe et al., "High Sex Ratios at Birth in the Caucasus: Modern Technology to Satisfy Old Desires."
[90] Lutz and Scherbov, "Survey of Fertility Trends in the Republics of the Soviet Union: 1959–1990."

crops were used to earn foreign exchange, and the state wanted to retain control over them. However, in other sectors, like food grains, the state implemented *land to the tiller* reforms. Therefore, the model predicts that some countries, like China, will show a decline in SRB even before the collapse of the Soviet Union.

After the collapse of the Soviet Union, the successor countries were faced with the question of how to redistribute the land to their citizens. This question was answered in two different ways, and the post-soviet countries largely fall into either of the two groups. The first group decided to return agricultural land to the owners (or heirs) from whom the land had been expropriated (usually after WWII). This process was called the restitution group. In contrast, the second group did not return agricultural land to the original owners. Instead, this group decided to hand *ownership* to the members of the collective farms that existed at their independence. This group followed the *land to the tiller* policy.

There was some endogeneity in which group a country fell into. Some countries had less percentage of the population engaged in agriculture. These countries usually chose the first group of restitution. On the other hand, some countries had a larger proportion of the population engaged in agriculture. These countries chose the second route to manage political pressures in the post-Soviet world.

One exception to the second group was Russia. The country did not have high employment in agriculture. However, collectivization had been implemented in Russia in the earlier part of the 20th Century and had been accompanied by violence against large landowners. Consequently, it was impossible to trace land back to the original owners, unlike the countries that came under

Soviet control/influence after the end of WWII. Additionally, Russia, like China, had implemented some *land to the tiller* reforms before the collapse of the Soviet Union. Therefore, many families were in *de facto* ownership of agricultural land, and it was not feasible to evict them.

In this legal matrix, the model that land reforms cause son preference makes the following predictions. First, SRB decline was visible even before the collapse of the Soviet Union. Like China, countries that implemented *land to the tiller* reforms should show a decline in SRB from the time of such reforms and not from the time of the collapse of the Soviet Union. Second, countries that implement *land to the tiller* reforms after the collapse of the Soviet Union will show an SRB distortion from that period. Finally, instead of *land to the tiller reforms*, countries that engage in restitution will show *no appreciable SRB distortion*.

Land to the Tiller Countries

Russia underwent a small but noticeable SRB distortion in the mid 1980ss. This distortion is significant because Russia, unlike the countries in Asia, maintained very high-quality birth records from the late 1950s.[91] The Russian case does not match the fall of the Soviet Union because the de-collectivization of state-owned farms started before the collapse of the Soviet

[91] Lutz and Scherbov.

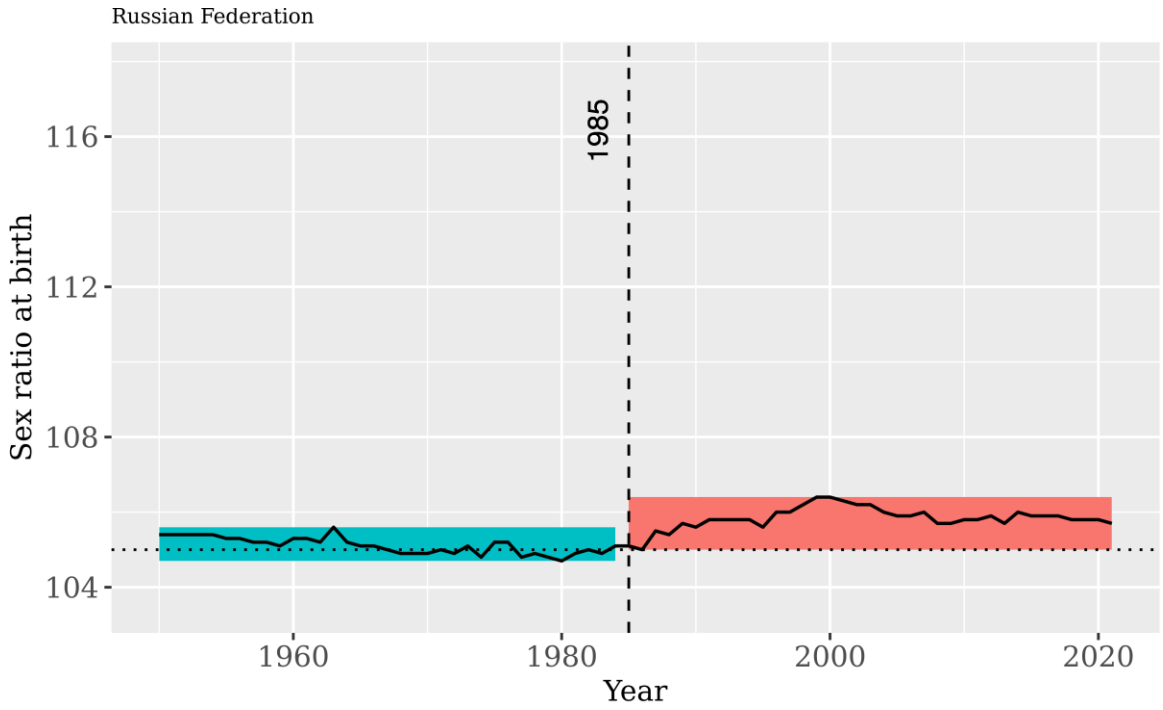
Union. In some of the Siberian parts of the Soviet Union, the process started in the early 1970s. However, when Gorbachev came into power, a system where family members owned a plot of land and equipment for several years became more prominent.[92] The author observes:

> *"The law on the arenda guarantees long-term (fifty-year) leases. It presumes that leases will be normally renewed and allows the lease to be inherited by a family member who has been working on the property. Although the farmers do not own the land under current legislation nor can they sell the right to use it, these tenure provisions allow family farming for the first time since collectivzation."*[93]

These Gorbachev era reforms created a *land to the tiller* legal system for parts of the USSR where the legal reforms were implemented. The farmer was allocated land from the collective for which he had to pay rent. The sale of agricultural land was not possible, and a family member had to be present to cultivate the land. Thereby, an incentive to have a son was created. Russia reports a slight but measurable increase in male births over female births around the time the *land to the tiller* program is created (figure 17).

[92] Moskhoff, *Perestroika in the Countryside: Agricultural Reform in the Gorbachev Era*.
[93] Moskhoff.

Figure 17. Russia's SRB deteriorates with Gorbachev's reforms.



While the membership to a collective farm was on an individual basis, the private plot was awarded on a *per-family* basis.[94] The more households an extended family can generate, the more private plots the family can control. Therefore, farmers would prefer to have more sons as, when the sons reach adulthood and marry, they would be considered a new family, and consequently, these new families would be entitled to plot from the collective. On the other hand, if a farmer

[94] Gsovski, "Soviet Civil Law: Private Rights and Their Back-Ground Under the Soviet Regime."

has a daughter, the daughter will be counted as a member of her husband's family and would not be entitled to land that her father could control.

The deterioration in SRB in Russia is small. This small change may be explained by the fact that a significant proportion of Russia had urbanized by the 1980s. In 1991, only 14% of the Russian employed population was engaged in agriculture. The theory predicts that the SRB deterioration will worsen in countries where a larger percentage of the population is engaged in agriculture.

In contrast to Russia, Albania had 58% of its working population engaged in agriculture in 1991, and land had been under collectivization since the 1920s. After communism collapsed, Albania adopted a *land to the tiller* system to redistribute collectivized land back to farmers. This reform contrasted with some of its neighbors that decided to revert agricultural land to their pre-communist owners.[95] The policy was supposed to distribute land per capita. However, due to shortages in many places, agricultural land was frequently allocated per family, where a family was defined as a husband-wife couple. Land use records called *tapi* were recorded in the name of the head of the family, usually a male.[96] Therefore, more males in the family would allow a family to create more *legal families* to obtain *tapis* for controlling more land.[97]

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[95] Lemel, "Rural Land Privatisation and Distribution in Albania: Evidence from the Field."
[96] Valletta, "Status of Land Reform and Real Property Markets in Albania."
[97] Valletta.

In addition to *tapis*, son preference should be encouraged by restrictions on the transfer of agricultural land received through redistribution. Before de-collectivization, Albania had three types of agricultural land– cooperatives, private family plots, and state-owned farms. Ownership certificates were provided for cooperatives and family plots, but for state-owned land, the government distributed '*in use*' certificates.[98] The farmers had to *use* the land to maintain property rights over it as agricultural land sale was prohibited in the original law transferring land to the farmers.[99] These restrictions were reduced in 1995, but land transfer remained subject to multiple restrictions. Valletta points out that selling agricultural was limited by:

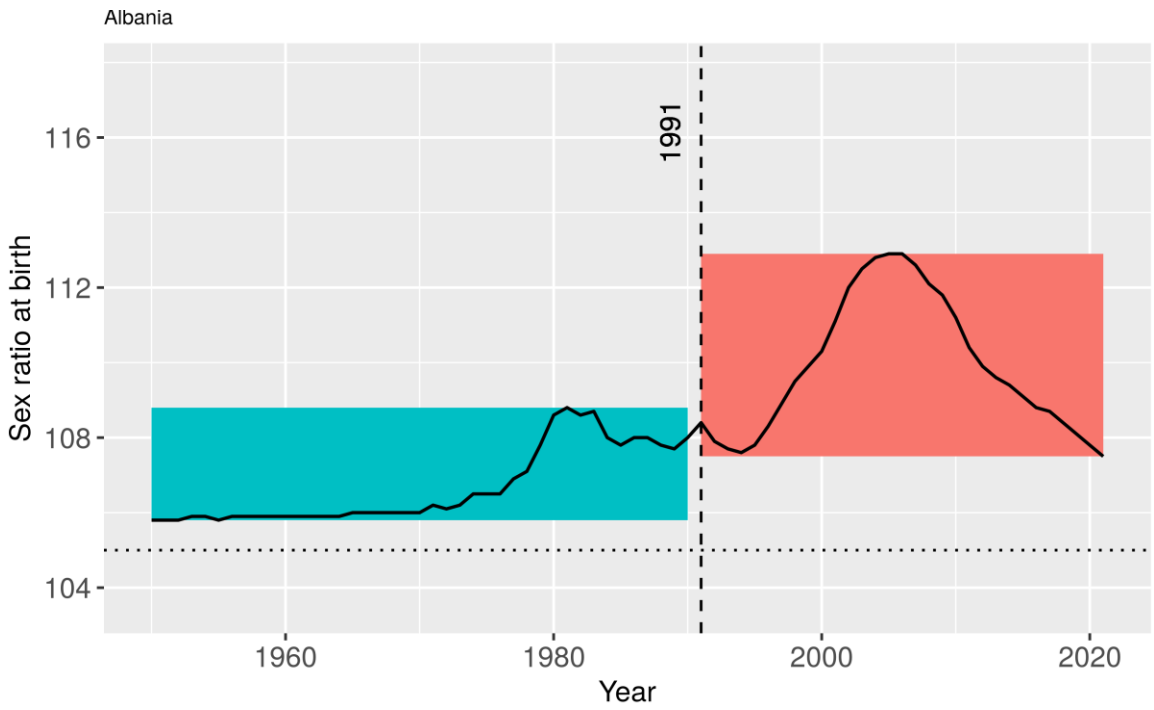
(a) "the right of first refusal, which required that a seller must first offer his land to members of his family, then a neighbor, then to the ex-owner, then to village members, before being able to offer it to a third party buyer; and (b) by joint family ownership without providing an operational definition of what constitutes a family."[100]

Even when restrictions were further reduced in 1998, other issues like lack of titles, high transfer taxes, and other administrative restrictions prevented the development of an agricultural land market.[101] These restrictions reduce the market price of the land but may not affect the cash flow

[98] Lemel, "Rural Land Privatisation and Distribution in Albania: Evidence from the Field."
[99] Valletta, "Status of Land Reform and Real Property Markets in Albania."
[100] Valletta.
[101] Sabates-Wheeler and Waite, "Albania Country Brief: Property Rights and Land Markets."

from agricultural activity. This artificial price depression may force families to continue to farm when it would be better for them to sell the land and exit. One way to respond to this pressure is to produce a male heir who may be able to work the land after the present generation is too old to cultivate the land.

Figure 18. Albania depends on agriculture and implements land to the tiller reforms.



As expected, Albania observed a significant deterioration of SRB after the land reforms were implemented (figure 18).

Like Albania, Georgia did not return agricultural land to farmers after the Soviet Union collapsed. Instead, the country transitioned to a partial *land to the tiller* system. The system was a result of two pieces of legislation: *On the Ownership of Agricultural Land* and *Law on the Lease of Agricultural Land*. Both laws placed significant restrictions on the ownership and

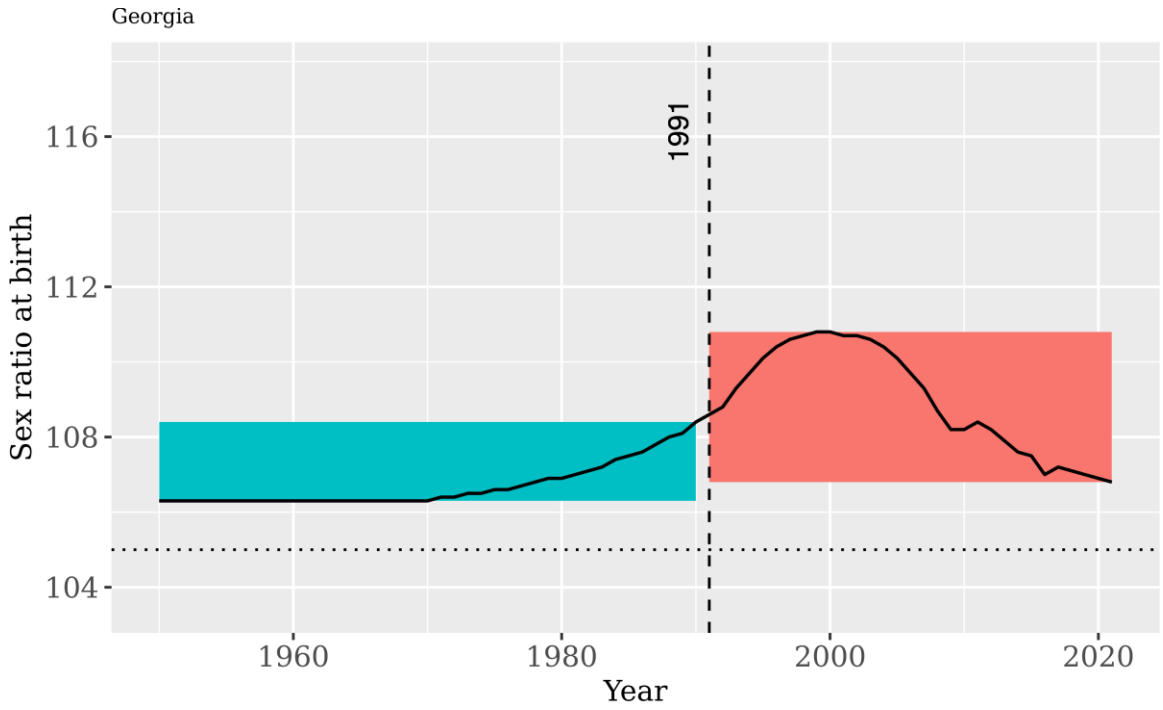
transfer of land. Private landowners could not change the land from agricultural land to any other use without government approval or transfer the land to a non-farmer.[102] These land ownership restrictions slowed the growth of private ownership. Land transfers were further discouraged because collective farm officials preferred to lease land rather than sell them, and land sales faced taxation, registration, and quality issues.[103] Consequently, till 2001, only one-fourth of the land was in private hands.[104]

The rest of the land is usually leased from the government, and such leases are governed by the law governing land leases.[105] These leases carry all the restrictions that create the pressure to produce sons. The leases are inheritable; therefore, if a farmer has a son, he can continue enjoying the property.[106] However, the farmer is not allowed to sub-lease the land; therefore, if the farmer has a daughter and wants to retire by sub-leasing the land, it is not possible.[107] The farmer is also restricted from converting the land to any other use and exiting agriculture.[108] These lease restrictions apply to a large portion of the population because Georgia, by employment, remains a significantly agricultural society, with 38% of the working population

[102] Georgia, On the Ownership of Agricultural Land.
[103] Jones, "Georgia."
[104] Jones.
[105] Georgia, Law on the Lease of Agricultural Land.
[106] Georgia.
[107] Georgia.
[108] Georgia.

engaged in Agriculture in 2019.[109] Consequently, Georgia should face significant pressure to produce male heirs.

Figure 19. Georgia underwent a significant SRB decline like Albania.



The pressure to produce male heirs leading to sex-selective abortions is visible in Georgia's SRB (figure 19). However, the timeline of SRB distortion does not fit perfectly with the reforms but precedes it. This time difference may be because of the carryover of the Soviet Reforms from the

[109] The World Bank, "Employment in Agriculture (% of Total Employment) (Modeled ILO Estimate)."

Gorbachev era. As a largely agricultural part of the Soviet Union, the soviet *household* system would have created pressure on Georgia to prefer sons from way back in 1978. This is because Georgia's economy was around 30% agricultural, in 1990.[110]

The pressure to produce sons seems to be decreasing in Georgia SRB has trended back toward natural levels since the 2000s (figure 19). This is also in line with legal reforms that have removed restrictions on land ownership. Land ownership became freer after 1999 when many restrictions placed through On the Ownership of Agricultural Land were removed.[111] Additionally, a new law encouraged the state to sell land that the state was previously leasing to farmers. These restrictions should have reduced the pressure on farming families to produce sons, reflected in the SRB improvement since the mid-2000s.

Like Albania, Georgia, and other ex-Soviet nations, Armenia decided to implement *land to the tiller* reforms to distribute land *after* the collapse of the Soviet Union. However, unlike Russia, Armenia had not implemented *land to the tiller* reforms before the collapse of the Soviet Union. Therefore, until 1990, collective farms controlled 96% of the arable land.[112] This arable land was divided between the farmers in a village, but the government placed a condition on the beneficiaries. The beneficiaries were required to live in the village and work the land to keep

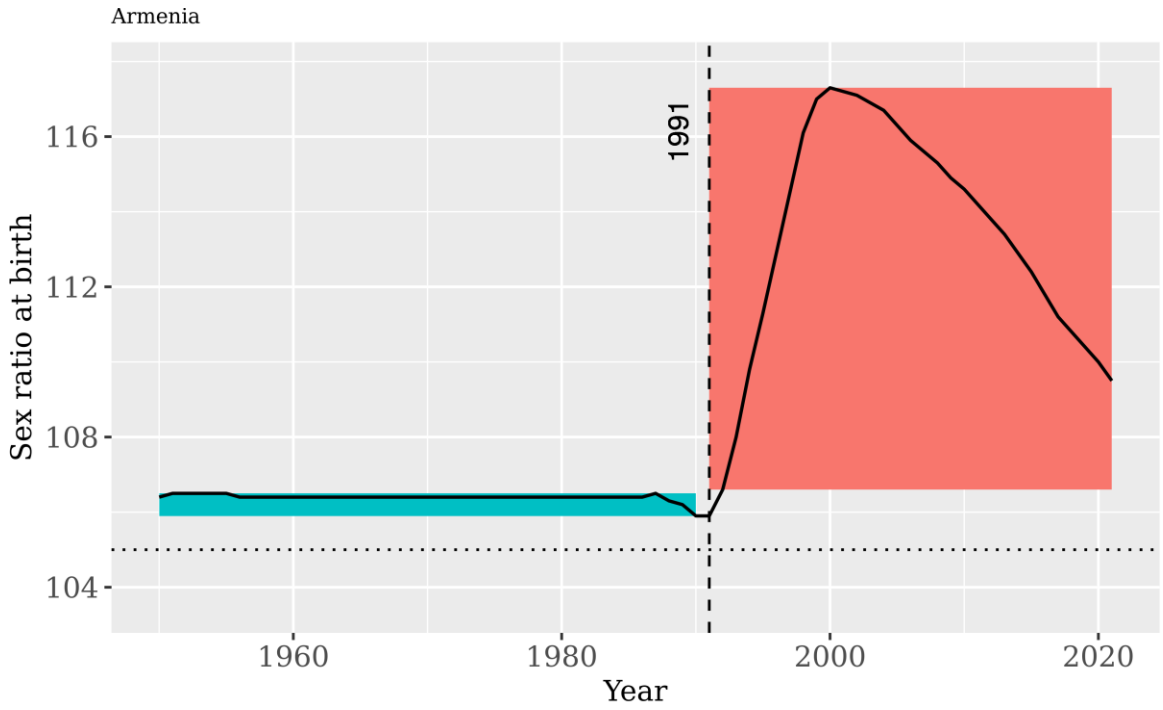
[110] Jones, "Georgia."
[111] A 1999 amendment removed the conditions for transferring and selling agricultural land.
[112] Lerman and Mirzakhanian, *Private Agriculture in Armenia*.

ownership. They could not sub-lease the land, move to an urban area, and become absentee owners.[113] Laws allowed farmers to buy land from the collective, but the government did not implement this provision. Consequently, by 1997, state cooperatives still owned two-thirds of the agricultural land and *leased* it to families.[114]

These legal restrictions create a *land to the tiller* system in Armenia. Consequently, the farmers are forced to prefer sons over daughters, and a *steep distortion* in SRB is observed in Armenia (figure 20). Unlike Russia, the SRB distortion starts when the model predicts.

[113] Lerman and Mirzakhanian.
[114] Lerman and Mirzakhanian.

Figure 20. Armenia's SRB decline starts with land reforms.



The Soviet Union was not geographically close to Cuba but shared deep political and economic ties with the Soviet Union. However, unlike the Soviet Union, Cuba is yet to transition to capitalism. This challenges the theory that the transition to capitalism causes son preference. Additionally, Cuba's SRB decline happened after pre-natal sex determination technologies (like amniocentesis and ultrasonograms) became widely available. Therefore, the *technology access* does not explain Cuba's SRB decline in the early 1990s.

However, the 1990s saw Cuba undergo the same *land to the tiller* reforms that explain son preference in other countries. Cuba's land reform followed the trajectory of China and other ex-soviet states and started with the collectivization of land into state-owned farms. This collectivization started soon after the Cuban Revolution and was largely complete by 1963, when

most sugar plantations and *other farms* came under state control.[115] In addition, farmers (now employees of state farms) were promised generous pensions. These pensions would act as economic support when the farmer retired, reducing the uncertainty of income in old age.[116] In addition, some attempts were made to introduce price/production-based incentives in the 1970s, but the collective system continued.[117]

Cuba, unlike China, resisted de-collectivization till the collapse of the Soviet trading system in 1989-90. This lack of reform was possible because Cuba's large state-owned farms would export sugar to the Soviet-bloc nations on favorable terms and then use the foreign exchange to import food from the same soviet countries.[118] This trading system collapsed in 1990, leading to food shortages. Consequently, the Cuban government was forced to consider reforms to increase food production.

Cuba implemented reforms similar to those in socialist countries like China. Between 1992 and 1993, all state-owned farms were divided into *basic production units* (UBP) and were handed over to families.[119] The families had to hand over a target production amount to the state and could keep the rest, just like China. Like China, Cuban farming families were given *permanent*

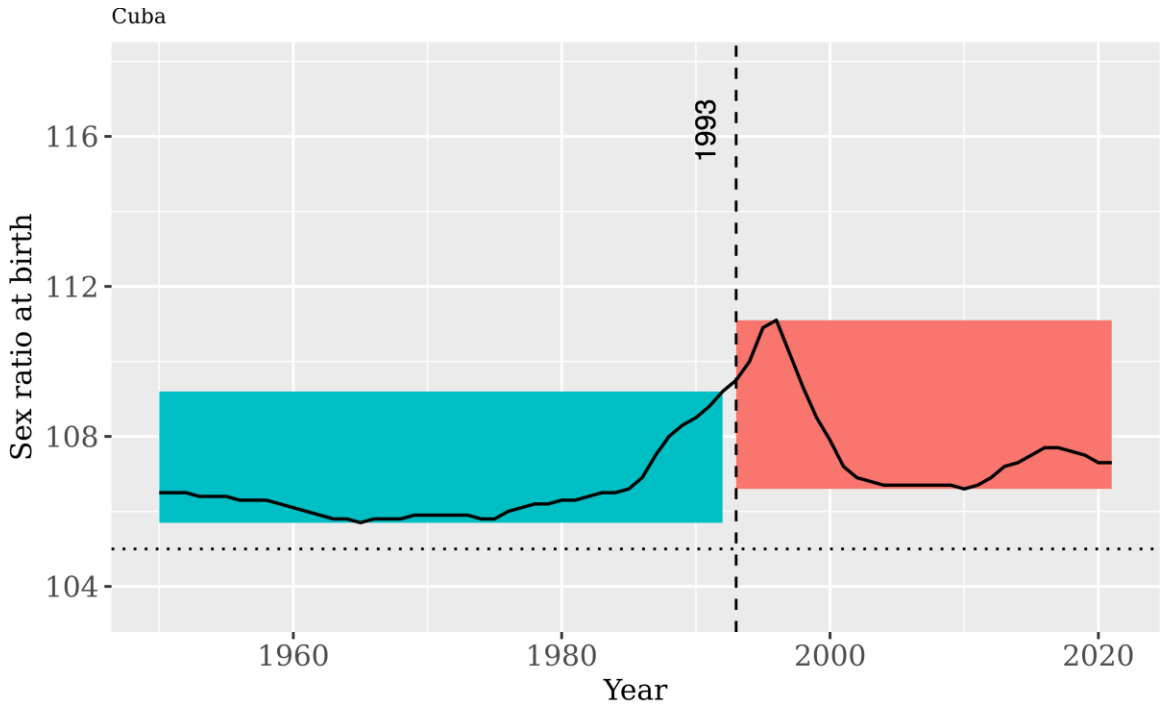
[115] Kay, "Economic Reforms and Collectivisation in Cuban Agriculture."
[116] Kay.
[117] Kay.
[118] Claudio, "The Challenge for Cuba."
[119] Schultz, "Food Sovereignty and Cooperatives in Cuba's Socialism."

leases and did not get title to the land. The farming families paid the lease rent by handing over a share of the production to the state, but a farming family could not sell the land to exit agriculture. Cuba also had restrictions on hiring wage laborers by the private sector, and therefore, such families could not get laborers, in the absence of sons, to farm their land.[120]

The family farming system was formalized through a legal decree in September 1993.[121] *Around the same time*, SRB of Cuba distorts in favor of sons (figure 21). However, unlike other countries, SRB distortion happened in Cuba slightly *before* the 1993 legal change due to informal changes implemented even before the law was changed. A similar change in observed in China, where the first *family contracts* were informal in 1978 and then formalized by 1983.

[120] Kay, "Economic Reforms and Collectivisation in Cuban Agriculture."
[121] Schultz, "Food Sovereignty and Cooperatives in Cuba's Socialism."

Figure 21. Cuba's SRB diverges around the same time as legal reforms create a land to the tiller system.



Restitution Reform Countries

In contrast, some Soviet satellite states did not implement a *land to the tiller* program to redistribute agricultural land. Instead, these countries decided to revert agricultural land to their pre-communist owners through restitution.[122] These included the Baltic states and most Central

[122] Lemel, "Rural Land Privatisation and Distribution in Albania: Evidence from the Field"; Lemel.

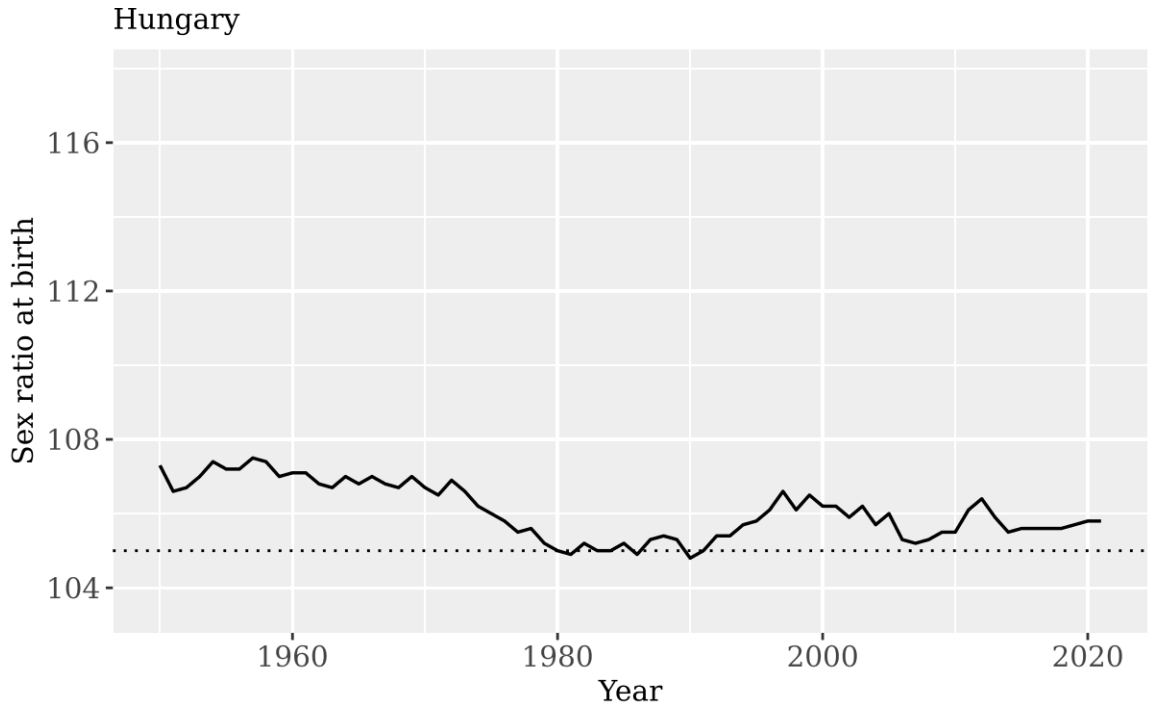
European countries like Hungary. SRB data for Czechoslovakia and East Germany are unavailable in these countries. This difference in land reform explains why the Baltic states and Bulgaria in do not undergo SRB distortion after the collapse of the Soviet Union.

Like the Baltic States, Hungary did not show SRB distortions after the collapse of the Soviet Union because Hungary adopted a *partial* restitution model. In this model, pre-1945 owners were compensated with cash, and the cooperatives were broken into individual plots to be distributed among the former employees/members of the agricultural collectives.[123] However, there were no restrictions on the transfer/mortgage of land after the initial allotment. This form of reform allowed most beneficiaries to lease the land back to cooperatives, which now operated like private businesses. Many beneficiaries even took shares in such business organizations in lieu of their land.[124]

The absence of transfer restrictions ensures that the farmers in Hungary could sell their land and exit agriculture. Therefore, Hungarian farmers were not pressured to beget sons, which is visible in Hungary's SRB (Figure 22).

[123] Kovács and Kovács, "Collectivisation and Decollectivisation in Hungary: Historical Problems of Landed Property During the Political Dictatorship."
[124] Mathijs, "Process and Politics of Agrarian Reform in Hungary."

Figure 22. Hungary's free land market allowed beneficiaries of redistribution to exit the market.



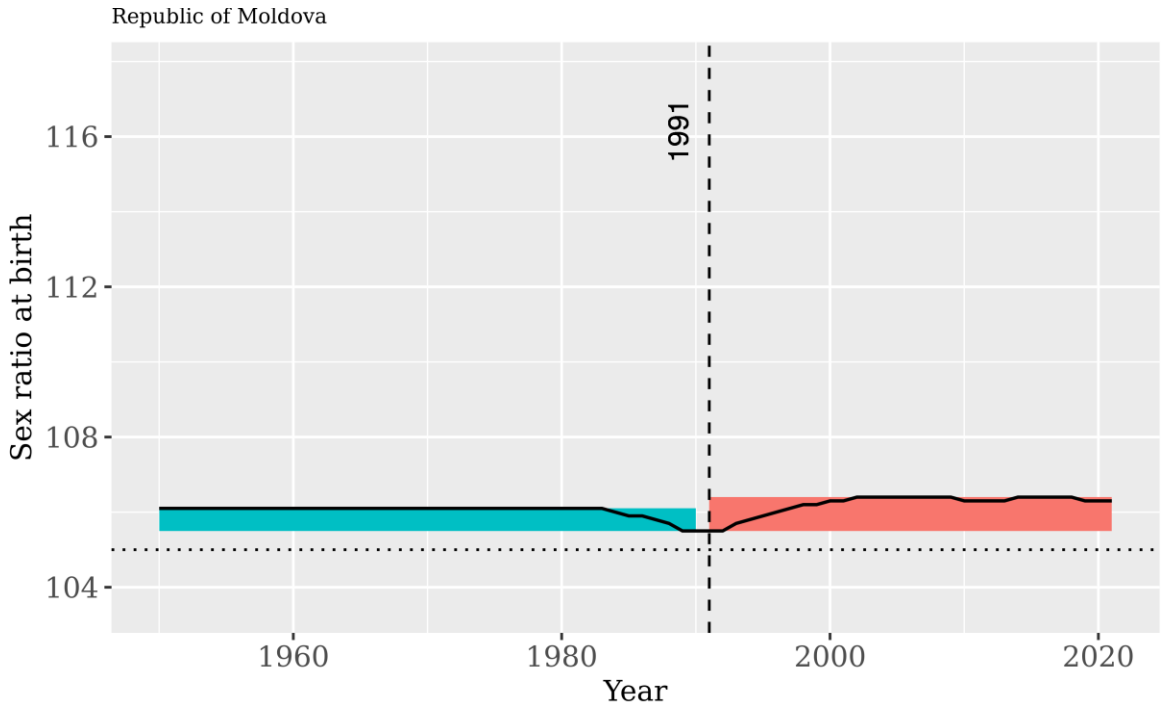
However, these findings may be colored by the proportion of the population engaged in agriculture. Unlike Albania, the Baltic states, Hungary, and Bulgaria had a relatively smaller proportion of the population engaged in agriculture (similar to that of Russia). Therefore, the pressure to produce male heirs may affect a smaller proportion of the population.

SRB in Moldova may further support the mechanism described here because, unlike the Baltic states, Moldova had a relatively high percentage of the population engaged in agriculture. In 1991, 43% of the Moldovan workforce was engaged in agricultural activities. The number stayed high until the early 2000s, declining to 21 percent in 2019. Moldova's healthy SRB after independence from the Soviet Union is an exception, as the country saw a slight but insignificant rise in male births after 1991(Figure 23).

The SRB in Moldova may be explained by the country's difference in the agricultural land de-collectivization process. Instead of a *land to the tiller* program, Moldova decided to grant securities (like shares) to members of cooperative farms from the Soviet Union.[125] The securities represented a share of the total property and profits of the cooperative farm. The beneficiaries, former cooperative employees, had two choices with the securities. First, they could continue holding the securities and earn a proportional share of the cooperative's profits. Second, the farmer could *exit* from the cooperative by taking land representing his share in the cooperative.

[125] Lerman, Csaki, and Moroz, "Land Reform and Farm Restructuring in Moldova: Progress and Prospects."

Figure 23. Moldova shows a Slight increase in SRB but then reverts.



Moldova initially (1991-92) placed restrictions on freedom to transfer land that was similar to a *land to the tiller* program, but this restriction did not survive. Initially, Farmers were under a ten-year moratorium on the sale and purchase of private land that was supposed to expire in 2001. Additionally, the 1991 law had also placed other restrictions on withdrawing from cooperatives. However, in 1996, the Constitutional Court of Moldova ruled against these restrictions because they violated the natural rights of farmers.[126] In response, the Moldovan legislature allowed sales

[126] Lerman, Csaki, and Moroz.

after five years and even before that if the owner was incapacitated, changed his profession, or died.

In line with the mechanism, Moldovan SRB showed a slight deterioration in the early 1990s. The legal change in 1996 may explain why Moldova's SRB returned to natural levels before other post-Soviet states in the region.

Improvement in SRB

The SRB distortion in favor of sons has seen some improvement in the recent past. Since the early 2000's two countries seem to have returned to normal SRB: Korea and Taiwan. In 2021, Korean SRB was 105.7, down from a peak of 115.7 in 1990 (Figure 13), and Taiwan's SRB stood at 107, down from a peak of 110.1 in 2004 (Figure 14). Even Chinese (mainland) SRB has shown signs of moving in the right direction, as it has fallen from a peak of 117.8 in 2006 to 111.8 in 2021.

In the literature, this improvement in SRB has been attributed to economic growth leading to the population abandoning regressive traditional values and the economy providing new employment opportunities for women. Korea's SRB improvement has been attributed to women's education; female labor force participation; the breakdown of pre-industrial social structures; and the transition to democracy that led to the repeal of laws and policies that kept

women marginalized.[127] Similarly, Taiwan's SRB improvement has been attributed to the better education of the younger generations, which led to a decline in traditional regressive values.[128]

In contrast, the *land to the tiller* reforms mechanism provides a better explanation for the improving SRB. According to the mechanism, SRB should start trending toward natural levels if the restrictions stop operating on farmers. Restrictions on farmers under *land to the tiller* laws can stop acting in two ways. The first mechanism is f the laws placing the restrictions are amended or repealed. For example, farming families will have no pressure to produce sons if the laws allow farmers to freely sell land or (more importantly) convert land to other uses. In addition to the repeal of *land to the tiller* restrictions, SRB may also improve if families stop engaging in agriculture. When a family has completely left agriculture, the preference will go away as other professions do not produce the same pressures as *land to the tiller* reforms. Therefore, the lesser the population engaged in agriculture, the lesser the preference for sons.

Korea and Taiwan both follow the predictions of the mechanism. Both countries have progressively removed restrictions on land transactions. As Korea rapidly industrialized in the 1970s, new job opportunities attracted people away from the farms. The only solution to keep farms operational was to lease plots to existing farmers. In 1986, the government enacted the

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[127] Das Gupta et al., "Why Is Son Preference so Persistent in East and South Asia? A Cross-Country Study of China, India and the Republic of Korea."
[128] Lin, "The Decline of Son Preference and Rise of Gender Indifference in Taiwan since 1990."

Farmland Lend-Lease Act. This law allowed farmers to lease out their agricultural land. Now, a farmer with daughters could lease their land after retiring, reducing the pressure to produce a son. Another set of restrictions went away in 1994 with the enactment of the Farmland Act, which allows farmers wishing to exit agriculture a better price.[129] The authors note notes that since the 1994 law, "*regulations on ownership and use of farmland have been greatly eased following changes in socio-economic circumstances*."[130] The agricultural land ceiling gradually raised from the 1990s before it was finally done away with in 2002. Concurrently, farmers were *again* allowed to convert agricultural land into urban/industrial land under the National Land Planning and Utilization Act of 2002. These measures would have restored the freedoms on land use and thereby allowed retiring farmers to get a better price for land sold than when agricultural land use change was greatly restricted in the 1970s.

Similar to Korea, Taiwan has also removed restrictions on farmers as the country rapidly industrialized. In the 1990s, legal reforms started removing or diluting the restrictions on farmers that had been placed on Taiwanese farmers since 1973.[131] For example, in 1995, 300,000 ha of

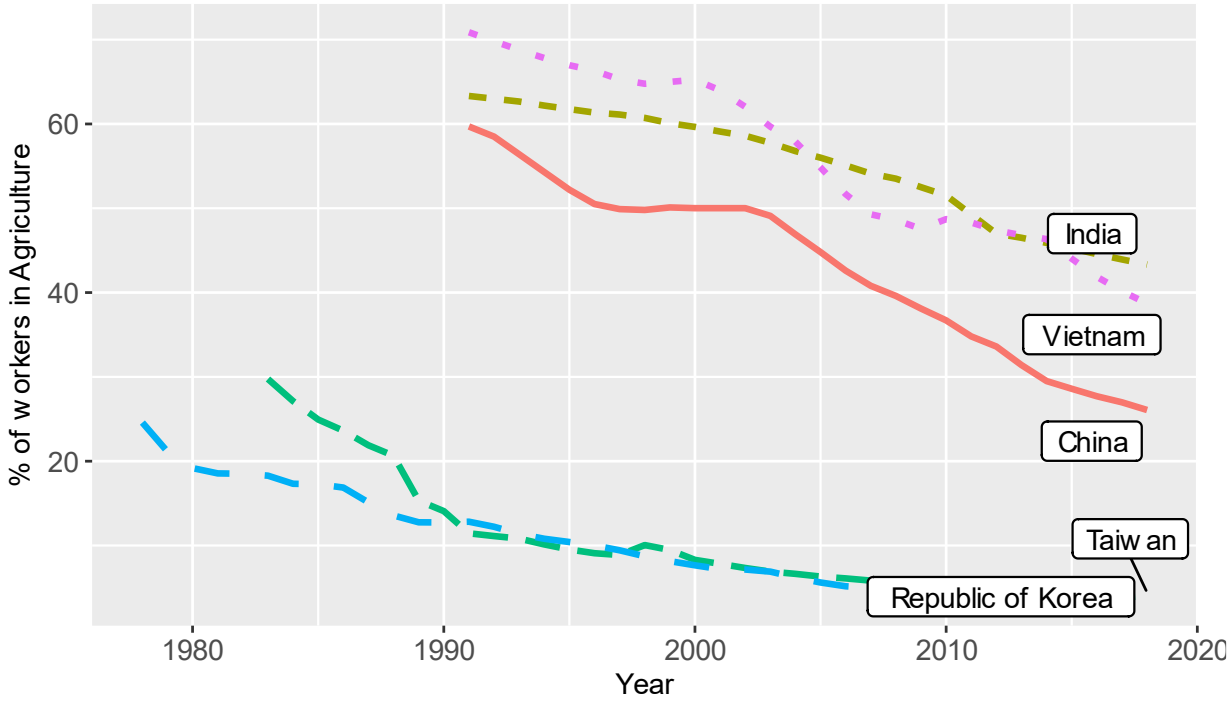
[129] Im, "Farmland Policies of Korea."
[130] Im.
[131] Chen et al., "A Comparative Case Study of Cultivated Land Changes in Fujian and Taiwan."

agricultural land was allowed to be converted into non-agricultural uses.[132] Finally, the government diluted the 1973 law restricting land use change in 2000.[133]

Concurrently with these changes in laws, both Korea and Taiwan rapidly industrialized. As a result, agriculture employs a lesser proportion of the working population yearly. Estimates of the South Korean population engaged in agriculture are available from 1983. They show employment in agriculture fell from ~29% in 1983 to ~5% in 2020 (Figure 24), drastically reducing the population under pressure to produce sons. These legal changes followed the drastic fall in agricultural employment. Between 1978 to 2022, Taiwan's agricultural workforce fell from 24% to 4% (Figure 24).[134]

[132] Chen et al.
[133] Chen et al.
[134] Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C. Taiwan, "Employment and Unemployment Statistics Enquiry System."

Figure 24. As the population dependent on agriculture falls, the pressure to begete sons reduces.



Unlike Korea and Taiwan, China's SRB is still far from the natural ratio. However, since 2005, China has seen a positive trend in its SRB. This improvement is visible from 2005 and can be explained by the effect of land reforms. China still places restrictions on farmers and prevents direct ownership of agricultural land. However, the proportion of the population depending on agriculture has dramatically fallen. Agriculture employed 60% of the working population in 1991 but employed only 25% of the population in 2019 (Figure 24). As a consequence, the pressures of the *land to the tiller* reforms act on a smaller proportion of the population even if it continues to be in force (unlike South Korea and Taiwan)

While China shows some improvement in SRB, Vietnam, and India are yet to show an appreciable trend toward the normalization of SRB. Again, the model of pressures on farmers

explains this trend. Unlike Taiwan and Korea, Vietnam and India still employ a significant proportion of their working population in agriculture (38.7% and 43.3%, respectively). Additionally, both countries (unlike Korea and Taiwan) have not changed their *land to the tiller* restrictions. Therefore, the mechanism continues to pressure more families to prefer sons in these countries.

Conclusion

The literature on *missing women* has brought the problem of sex-selective-abortions to *global* attention. Some countries have severely distorted their male-to-female ratio. This distorted ratio will have significant societal, political, economic, and personal impacts for decades. However, existing literature has not provided a satisfactory explanation that accounts for SRB distortions in various countries. Explanations have been partial or speculative, as no mechanism has been suggested for how SRB distortions rise in the first place.

The pressure on farming families can explain SRB distortions due to *land to the tiller* reforms. These reforms are generally implemented to redistribute land, but the reforms also include other restrictions on the farmers benefiting from the redistribution.

The Indian state has launched carrot and stick measures to address sex-selective abortions. For carrots, there are multiple programs to encourage families to keep the girl child. These include cash transfers at the birth of a girl child, free higher education for the girl child, cash for weddings, etc. Some of these programs are run at the federal level, while many more are at the local level. Similarly, the stick has been the outlawing of pre-natal sex determination. The government has made identifying the sex of the fetus a criminal offense. Ultra-sonogram

machines are heavily regulated (thereby increasing the cost of their legitimate use), and doctors face imprisonment for telling prospective parents the sex of the fetus. In addition to these specific interventions, the state has launched multiple awareness programs identifying sex-selective abortions as a social problem.

These interventions are driven by a specific understanding that son preference is a cultural/social practice. Parents have an irrational preference for sons driven by religious, family, or cultural motives. Similarly, China seems to have identified the *one-child policy* for the SRB distortion in China. The *one-child policy* was repealed in 2015, and there is hope that this will lead to the normalization of the SRB.

However, as this analysis suggests, son preference may not be an outcome of the common explanations in the literature. Instead, a specific type of land reform forces farming families to prefer sons so that the families can continue to have access to land when the first generation is too old to cultivate land personally. Therefore, the policies followed by countries to correct SRB may not be effective. As long as the pressure on farming families continues, son preference will be visible through sex-selective abortions. *Soft nudges* or even strong punishment will not be enough to discourage families from facing the loss of their only source of income.

On the brighter side, the model provides a pathway for countries to correct SRB distortions. According to the model, there are two pathways by which SRB may start trending toward natural levels. First, enough people move to occupations other than agriculture. Once a family does not depend on agriculture, the pressure to produce sons to hold on to land goes away. This explains the positive news from Korea and Taiwan about improving sex ratios. The second way is that

countries remove land transfer restrictions, allowing farming families with daughters to sell their land or convert it for other uses. For these transactions to be possible, the country must have a functional land market with few (if any) restrictions on transfers and holding, as this would increase the price that such families can get.

This model is also a good example of the *unintended consequences* of legal reforms that involve restrictions on private individuals. Wider lessons may be drawn about the consequences of imposing constraints in one sector that may lead to responses in unexpected ways in other sectors. These *unexpected consequences* may even arise when the original restrictions have some socially positive outcomes.

NIMBYISM AND FISCALLY AFFORDABLE HOUSING

The problem of housing affordability has plagued the U.S. as house prices have consistently beaten income and inflation. There is a growing consensus that zoning regulations drive this price rise. City regulations consistently make it difficult to build affordable housing, especially in high densities like apartments. This resistance to new developments has been noted in the literature as NIMBYism—the phenomenon where residents oppose new developments in their neighborhoods. This NIMBYism is generally enforced through laws that make it challenging to construct high-density, affordable housing.

NIMBYism has been studied extensively in the literature, and many streams of academia like psychology, sociology, and law and economics have recorded and studied the resistance to affordable housing. There is agreement that the phenomenon is undesirable. There is growing consensus that regulations from NIMBYism are the predominant driver of the lack of affordable housing in the US. This results in negative consequences for people left out of the housing market due to excessive restrictions arising from NIMBYism.

However, there is little academic consensus on the *cause* of NIMBYism against affordable housing. Multiple explanations have been provided, ranging from the greed of developers to racism, irrational voter behavior, and risk aversion. This diversity of explanations has even raised doubts about whether NIMBYism is a single phenomenon.

Three strands dominate the explanation for NIMBYism in the law and economics literature: (i)Tiebout's sorting based on local expenditure; (ii) Glaeser's welfare maximization by the city government; and (iii) Fischel's *homevoter* hypothesis. However, all three models assume that the local government acts as a perfect agent of the votes. This paper attempts to contribute to this literature by proposing an extension to these explanations, modeling the incentives of the local government as an independent actor driven by public choice theory.

To develop this model, the paper tries to see affordable housing from the perspective of the local government. To the local government, every new housing unit represents a source of revenue *and* a source of expenditure. If the revenue from the household is the same as the spending on the household, then the government *breaks-even* on the home, it not then the government loses money on the home. Using this concept, the paper evaluates the fiscal consequences in a hypothetical city that undergoes an increase in housing density. The analysis shows that government finances worsen when the density of housing increases.

After this hypothetical scenario, the paper attempts to corroborate it with the real world. To check real-world outcomes, the paper uses a relatively new database of fiscal expenditures of the largest 200 cities in the U.S. published by the Lincoln Institute of Land Policy. This database is matched with the American Community Survey for data about home prices and property taxes.

The hypothetical scenario would not work out if there are significant economies of scale in city finances, i.e., if the city population increases, the cost of the city per citizen decreases. While this should be case, the paper finds that there are significant *dis-economies* of scale in U.S. cities. When city populations increase, expenditure per capita also increases. Moreover, the relationship

between city population and increase in expenditure has been increasing itself over time. Since the 1970s, cities have become more sensitive to population increase.

After showing the dis-economies of scale, the paper calculates the real *break-even price* of homes in the largest U.S. cities. The analysis of city finances results in two findings: (i) in most U.S. cities, the break-even price is higher than median home values, and (ii) the *break-even price* has been growing faster than the median home prices in these cities. This finding corroborates the hypothetical model proposed in the previous section.

Since there is detailed information about city finances, the paper then attempts to find the cause of the increase in *break-even* prices of homes in cities. A detailed analysis of the city finances shows that the increase in city expenditures is led by the increase in per-student expenditures in public schools. Over time, the per-student expenditures have risen so much that they have neutralized the savings that should have accrued from the decline in the student population (as a proportion of the total population) in U.S. cities over time. The paper proposes that this increase in expenditure may be driving the need to have low-density, expensive housing. When housing density increases, the number of students in the city schools will increase and that may drive up the expenses of the city.

After corroboration from fiscal data, the paper then proposes a new model for understanding NIMBYism—the incentives of the city government. The paper proposes that the observed lack of affordable housing is a product of interaction between the incentives of two different actors, the existing citizens of the city and the city government (driven by public choice). This paper is

the first paper that combines the incentive structures of these two parties instead of the existing models that assume that the government acts as a perfect agent of the citizens.

After explaining the model, the paper provides some implications of the model proposed in the paper. It predicts that merely putting pressure on city governments to allow higher density will not work as a sustainable and effective strategy to increase the availability of affordable housing in the U.S. Similarly, the paper also argues that the citizens are not always against affordable housing, but the existing fiscal structures *force them* to vote against the development of affordable housing.

An additional benefit of the model proposed in the paper is that it also explains the resistance to gentrification—the process by which affordable and high-density housing is replaced by unaffordable and low-density housing. This further indicates the generality of the model proposed in this paper.

The paper concludes with some policy implications of the model. It predicts that the current approaches to solving the problem may not be successful because they work against the interests of the city government and the existing citizens. It calls for new solutions that can be cognizant of the incentives of both the players in NIMBYism: the citizens and the city governments.

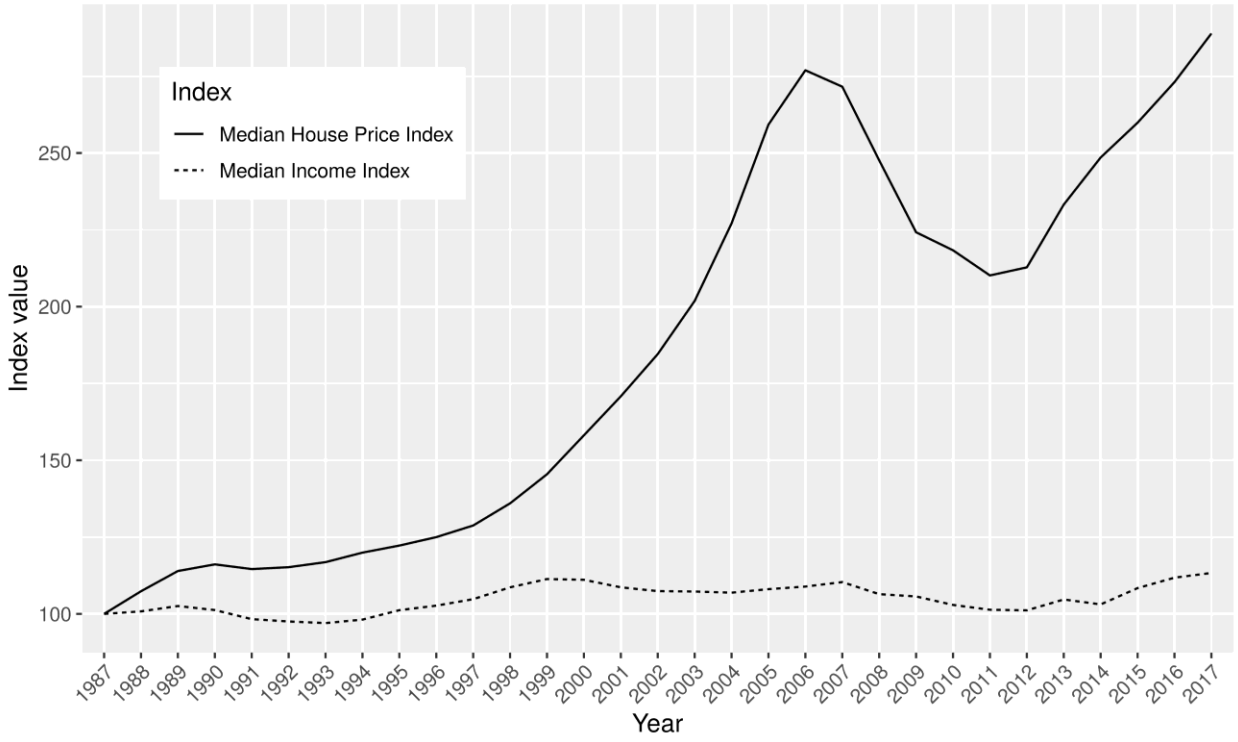
NIMBYism

Home prices in the U.S. have exceeded income growth over the long run (figure 25). Consequently, buying a median home takes more of the median income. There is some

consensus that this is being driven by *restrictive zoning.*[1] The motivation for this restrictive zoning is usually attributed to NIMBYism— commonly known as "Not In My Backyard." It refers to the resistance or opposition that arises when proposed projects, facilities, or initiatives are planned for implementation in a local community. Some NIMBYism is understandable. For example, no one would like to live next to a landfill; therefore, homeowners would vote for laws restricting the development of facilities that reduce the quality of their lives.

[1] Glaeser and Gyourko, "The Impact of Zoning on Housing Affordability."

Figure 25. Home prices have grown faster than income in the U.S. for a long time.



However, NIMBYism extends to another more insidious regulation, commonly called restrictive zoning. This is the phenomenon where city governments restrict the types of homes that can be built in an area. These regulations target reducing housing density in an area, usually by limiting houses to single-family homes. The regulations prohibit the construction of apartments, even small ones with two to four housing units, even when it is demonstrated that such units may

increase the supply of affordable housing.[2] This restrictive zoning results in large tracts of the city being restricted to only single-family homes. Badger and June recorded how significant parts of large U.S. cities were off-limit to apartments, an important source of affordable housing (table 4).[3]

[2] Mast, "Warding Off Development."
[3] Badger and June, "Cities Start to Question an American Ideal: A House With a Yard on Every Lot."

Table 4. The restrictions on apartments in U.S. Cities (2019).

City	Percentage of Land Reserved for Single-Family Homes
New York	15
Washington	36
Minneapolis	70
Los Angeles	75
Portland, Ore.	77
Seattle	81
Charlotte, N.C.	84
Sandy Springs, Ga.	85
Arlington, Tex.	89
San Jose, Calif.	94

*Source: Badger and June, 2019

This form of NIMBYism is combined with other regulations that work against the increased density of housing. A typical example of a restriction is the minimum lot size requirement, which not only limits residences to single-family but also requires such homes to leave large areas such as backyards or open spaces. For example, some Indianapolis areas require a minimum lot size

of three acres.[4] In addition to open spaces, literature has identified that zoning standards are responsible for making homes unaffordable.[5]

The explanation for NIMBYism

There is growing consensus that NIMBYism-driven regulations are responsible for Multiple explanations that have been forwarded to explain why residents resist development and promote NIMBYism. Interestingly, numerous fields of academia have attempted to explain residents' resistance, including psychology, sociology, history, urban planning, and economics. Since NIMBYism is implemented through regulations, legal literature has also discussed the phenomenon.

Psychological studies attribute NIMBYism to emotional responses and perceptual biases that shape how individuals perceive and react to potential changes in their surroundings.[6] Similarly, sociological explanations for NIMBYism have posited racism as a significant cause (and effect).[7] Another set of papers attributes NIMBYism to issues of social cohesion, power relations, and

[4] Dwelling Districts Zoning Ordinance of Indianapolis-Marion County.
[5] Glaeser and Gyourko, "The Impact of Zoning on Housing Affordability."
[6] Devine-Wright, "Rethinking NIMBYism."
[7] Hubbard, "Accommodating Otherness."

collective action within the context of proposed developments.[8] Voters fear losing their identity if there is a large influx of new citizens.

Legal literature has concentrated on documenting NIMBYism—for example, the expansion of NIMBYism from the suburbs to the core of the cities.[9] It has also tracked the development of NIMBYism in terms of historical development.[10] Some of the legal literature has also suggested solutions to the problem, mainly by constraining the freedom of the city governments in regulating housing.

However, these multiple approaches to NIMBYism do not seem to identify the cause of NIMBYism. Multiple explanations indicate that the literature has not identified the precise cause of why NIMBYism exists. This has become such a problem that there is now a movement to deny the concept itself.[11] Wolsink has pointed out that the multiple explanations of NIMBYism indicate that the phenomenon may be just an arbitrary collection of behaviors without any logical connection between them. The term itself may be distracting academics from studying exclusionary zoning more systematically.

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[8] Coppens, Van Dooren, and Thijssen, "Public Opposition and the Neighborhood Effect."
[9] Been, "City NIMBYs."
[10] Fischel, "An Economic History of Zoning and a Cure for Its Exclusionary Effects."
[11] Wolsink, "Invalid Theory Impedes Our Understanding."

Law and Economics literature

One area of literature that stands out in explaining zoning, NIMBYism, and housing costs is the area of law and economics. This also covers urban economics. In this area, there have been some attempts to create general models to explain the phenomenon. This area stands out also because it attempts to make predictions that can be tested empirically. This paper attempts to contribute to this literature by providing a modification to the models existing in the literature. The paper concentrates on three dominant strands of literature by Tiebout, Glaeser, and Fischel. While there are other economic explanations, these three authors dominate the economics literature. This paper contributes to these strands of literature by refining the models proposed by these three authors.

Tiebout dominates the earliest explanation of zoning in economics.[12] Tiebout posits that there is variance in the preference for goods and services that city governments provide. Some people may prefer schools for their children, while retired people may prefer to spend more time in parks. Tiebout predicts that groups of people will sort themselves into different cities, which will vary the relative spending on goods and services. This theory predicts that voters would like to discourage new citizens, who (i) either have a different set of preferences or (ii) are unwilling to pay for the public goods that the existing citizens consume. This would explain some level of

[12] Tiebout, "A Pure Theory of Local Expenditures."

NIMBYism for low-cost housing.[13] The existing citizens (in a high-income area) are used to contributing large amounts of property taxes to their city government. In return, they expect a high level of service. In such a city, low-priced housing would require the existing citizens to choose between three alternatives: (i) subsidize the new housing through taxes, (ii) change preferences for goods and services provided by the government, or (iii) enact zoning laws to deter affordable housing (the observed outcome).

This literature fails to explain the rise of cities with heterogeneous income groups. Cities are not composed solely of managers or solely of factory workers. Cities represent a mixture of income groups, and city governments must manage such divergent preferences.

After Tiebout, Glaeser proposes the next model.[14] Glaeser proposes that city governments maximize welfare for their citizens from revenue generated mainly from property taxes. The interaction between welfare maximization and revenue from property taxes explains the city government's choices. Glaeser's model considers that the city government's behavior will change if the government imposes development restrictions. Glaeser posits:

"Results are quite different if the locality can impose a growth control that limits the size of the city. A local government that cares only about the welfare of its citizens has a strong incentive to

[13] Fennell, "Exclusion's Attraction."
[14] Glaeser, "Chapter 4 - Urban Public Finance."

reduce new growth, as long as the city can achieve that result without lowering welfare in the city… This provides one of the possible explanations why localities may go too far, from a global perspective, in limiting the amount of construction within their areas."

Glaesers' explanation presumes a "local government that only cares about the welfare of its citizens." This presumption is not borne out in the real world. Public choice theory predicts that local governments also care about themselves. In such a system, governments maximize power and revenue. One way to grow revenue is to increase the city's housing. Glaeser's model ignores this.

The third model, proposed by Fischel, is called *homevoter*.[15] Fischel argues that homeowners have concentrated their wealth in their homes, which are their most significant asset. Sadly, this concentrated portfolio also depends on factors like the neighborhood. Homeowners are very risk-averse and concerned that any development may reduce the value of their homes. Therefore, existing homeowners resist all development through votes. Fischel admits that some developments may increase home value, but voters still resist them. Fischel attributes this to extreme risk aversion. According to Fischel, this resistance can be overcome by

[15] Fischel, *The Homevoter Hypothesis*.

insurance. Fischel proposes the value of homes at the cost of the developers that propose new affordable homes.

Fischel's theory dominates the literature but requires the reader to suspend rationality on behalf of the existing voters. In reality, homeowners and city governments resist many developments that increase home values. Attributing this behavior to irrational fear is not satisfactory.

This paper proposes another explanation for NIMBYism, exclusionary zoning, and the lack of affordable housing in cities—the role of the city governments. All the models proposed by Tiebout, Fischel, and Glaeser assume that governments act as perfect agents of the citizens. We know from public choice theory that this is not true. Therefore, this paper attempts to contribute to this literature by modeling a local government's incentives within the restrictions of property tax revenue.

Fiscally Break-even Homes

How do local governments see new developments, especially if they are affordable? In accounting and business, when production cost equals the sale price of the same product, the price is called a *break-even price* for the manufacturer. The same principle can be applied to taxes and benefits from the view of local government. In this analogy, the dwelling unit is the customer, and the municipal authority is the business. The municipal authority provides a set of services to each household. However, instead of prices, the municipal authority collects taxes. If the household generates taxes that equal the services the city provides, the household can be

considered as *fiscal break-even.* If the household generates less taxes, the city government will lose money. Since property taxes mainly finance city governments, the tax collected depends on the value of the dwelling unit.

Hypothetical

A hypothetical elucidates the fiscal considerations for a city. In this hypothetical, the city's fiscal structure has two costs: (i) fixed costs that *do not rise* with the increase in population (like the costs to maintain a park in the city), and (ii) variable costs that *do rise* with the increase in city population (like expenditure on education per child).

In the initial period, this hypothetical city had just five single-family homes, each valued at $10,000. The property tax rate in the city is two percent, and consequently, each home pays $200 in property taxes to the city. This property tax is used to meet the city's expenses, which can be divided into fixed and variable costs. In this hypothetical, the city government incurs equal variable costs ($100 each) for each home. In this state, the fixed cost of running the city is $500, and the variable cost is $500. With $1000 in revenue, the city government will break even.

In the second period, one of the single-family homes was redeveloped into a condominium of four apartments, each worth $4000. How does this affect the city's public finances? The total value of homes in the city *rises* to $56,000 (four single-family homes at $10,000 and one condominium of four apartments at $4,000 each). The city's total revenue consequently rises to $1,120; apparently, the city is better off. However, when the costs of the city government are considered, the result changes. The city has a fixed cost of $500, as fixed costs do not change with the city's population. However, the variable cost of the city is now $900 ($100 for nine

homes instead of five); consequently, the city government's total expenses rise to $700. The city government will face a revenue loss of $280 per year.

In the third period, all five single-family homes are converted into four apartment condominiums. The total value of property in the city rises to $80,000. The total tax collected by the city goes up to $1600. The city government's variable expenditure increases to $2000 as there are now 20 homes in the city, compared to five in the beginning. If the fixed cost of the city remains at $500 (which is unlikely), the city still loses $900 per year. Table 5 represents this hypothetical situation.

Table 5. Fiscal situation analysis in a hypothetical scenario where condominiums replace single-family homes**.**

Period	House Type	House Value	Tax Collected (at 2%)	Fixed Cost	Variable Cost	Total Cost	Fiscal Position
1	5 Single Family (5 households)	10,000 X 5 =50,000	1000	500	500	1000	Break Even
2	4 Single Family + 1, 4-apartment condo	10,000 X 4 4000 X 4	800 320		400 400		
2 (Total)	8 households	56,000	1120	500	800	1,300	-180
3	5,4-apartment condos 20 household	5 X 4 X 4000 = 80,000	1,600	500	2000	2,500	-900

* All values independent of currency.

Measuring fiscal break-even

The hypothetical in the previous section can be validated through data from the real world. Cities collect property taxes from residents as a fraction (tax rate) of the value of the city's real estate, which is then used to pay for part of the city's expenses. The total property tax collected by the city can be divided by the city's household population to arrive at a property tax per household.

$$(Tpv * tr)/Thh = txhh$$

Where, in the city:

- *Tpv* is the total property value.
- *tr* is the property tax rate.
- *Thh* is the number of households.
- *txhh* is the property tax collected per household.

If a new household is added to the city, that household must generate (at least) the same amount of property tax (*txhh*) as the average property tax per household in the city.[216] From the previous equation, it is possible to calculate the value of the new real estate that must be generated in the

[216] Assuming that it is not feasible to rearrange the fiscal setup of the city due to adding a new household.

city to sustain the new household fiscally. This new real estate will be the new household's home value.[217]

$$txhh * (1/tr) = Pvn$$

Where:

- *Pvn* is the value of the new property for the new household in the city that will be fiscally break-even for the city government—the *break-even price*.

Fiscal consequence of higher density

One challenge to this hypothetical city is economies of scale. There is no need to assume that adding a marginal home to an existing city would increase the costs of the city government. Governments usually provide services that should benefit from scale. Traditional government services like policing, courts, roads, etc., *should not be* sensitive to population increases. There are initial fixed costs to setting up a police force, a judiciary, or trash collection. However, the incremental costs of adding a marginal resident should not be high. Therefore, the theory of *economies of scale* predicts that larger cities should have lower expenditure per capita than

[217] Assuming that there is no new commercial property created due to the entry of the household in the city. Even if this assumption is relaxed, the total real estate in the city still has to increase by the same amount. Some of it may be as commercial real estate and not the house of the new resident. However, this does not fundamentally affect the model.

smaller cities. In such a situation, cities should attract more population because it will be cheaper to live in larger cities, at least in terms of taxes.

However, contrary to expectations, the per capita expenditure of U.S. cities rises with the increase in city population. This phenomenon was noted in early municipal finance literature in 1969.[218] But, in 2013, Glaeser noted this literature has not been updated recently.[219] Since then, increased data availability has allowed for retesting if cities still suffer from *diseconomies of scale.* New data published by the Lincoln Institute of Land Policy provides for a deeper testing of the phenomenon observed in 1969.[220] This database contains fiscal data of 200 U.S. cities. The selection of cities is not random; it covers the largest cities in the U.S., with at least two cities represented from each U.S. state. This selection covered roughly 30% of the total urban population of the U.S. The data also goes back to 1977, which allows for trend analysis of the fiscal situation of U.S. cities (figure 26).

[218] Gabler, "Economies and Diseconomies of Scale in Urban Public Sectors."
[219] Glaeser, "Chapter 4 - Urban Public Finance."
[220] Lincoln Institute of Land Policy, "Fiscally Standardized Cities."

Figure 26. Per capita spending in a city usually rises with population increase.

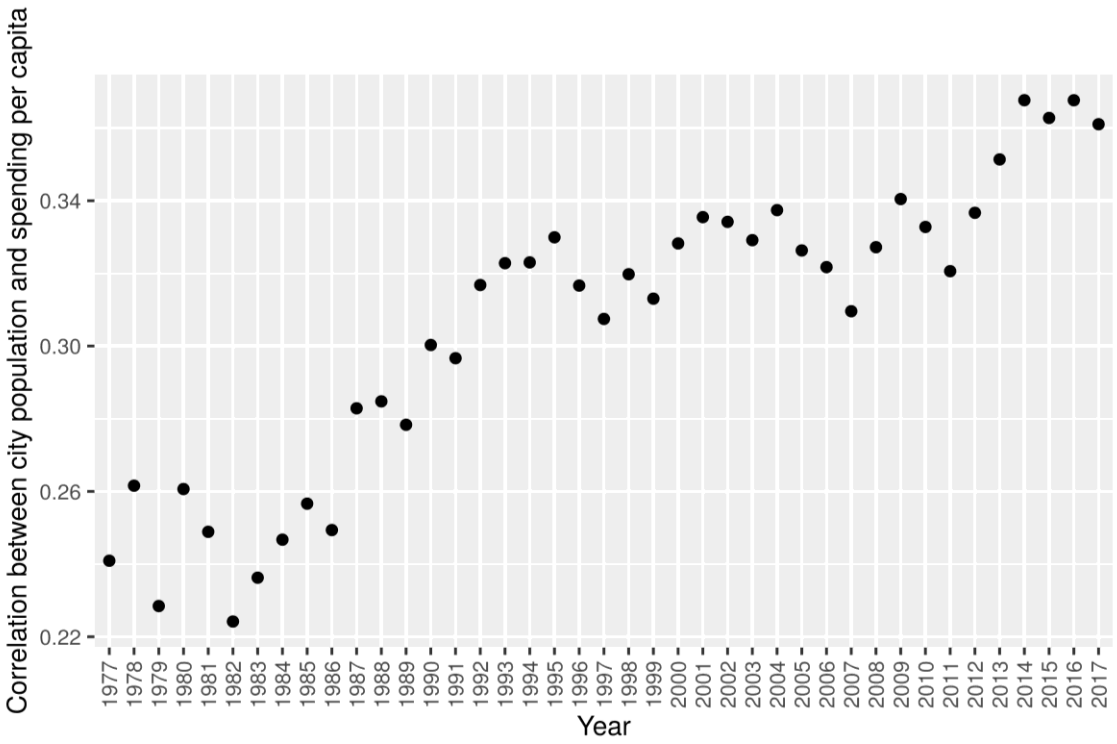


Figure 26 shows that city population and per-capita government expenditure are positively correlated, confirming Gabler's 1969 findings. Moreover, this correlation has become stronger over time. It was ~0.25 in the 1980s and rose to ~0.35 in the 2010s. This finding shows no observed economies of scale in the U.S.'s largest cities. Instead, if a city grows in population, the city government needs to find more revenue per capita. Therefore, taxes per capita have to increase in a city.

This finding generally explains the resistance of cities to increase population density. Increased population will lead to a greater fiscal burden on each citizen (new and old). Therefore, even

from this graph, it is reasonable to expect city governments (representing existing citizens) to resist increasing city populations. Thus, the model proposed in this paper overcomes a primary challenge to its real-world mapping—since there are diseconomies of scale, a city will resist new housing unless the housing offsets the increased costs that the city government will have to bear.

Calculating Fiscal Consequences of Growth

Going back to the model, a city's fiscal considerations force it to prefer new housing that generates enough revenue to offset the expense generated by the city. It is possible to calculate a city's real-world break-even price by merging two sets of data: fiscal and household level. The property tax collected per capita is available from the Lincoln Institute of Land Policy, for 200 U.S. cities.[221] However, tax is reported per capita but collected per household. Therefore, the number of households in a city is required. This information is available from the American Community Survey. The same survey also provides information on home values and household real estate taxes. Dividing real estate taxes by home values provides the cities' median real estate tax rate. Using this tax rate, it is possible to calculate the value of a home that would generate the same amount of property tax that the average current household generates in the city-- the *break-even price* for that city. Any new home in the city must be of this value (or higher) for the city's fiscal situation to remain stable. Any home cheaper than the *break-even price* will impose a

[221] Lincoln Institute of Land Policy.

fiscal burden on the city. Table 6 shows how the median home value in a city differs from the *break-even price* of a home for the U.S.'s 15 largest cities.

Table 6. The ratio between existing prices and *break-even prices* in 2017 for the 15 largest cities.

City	Population	Break-even Price	Median Home Value	Price Ratio
New York*	8,475,976	1,267,330	538,700	2.35
Los Angeles	3,969,262	462,944	549,800	0.84
Chicago	2,718,946	490,262	234,500	2.09
Houston	2,309,752	323,890	149,000	2.17
Phoenix	1,613,581	286,458	197,800	1.45
Philadelphia	1,576,390	217,713	151,500	1.44
San Antonio	1,488,512	244,841	127,700	1.92
San Diego	1,403,865	462,249	523,600	0.88
Dallas	1,324,477	284,526	154,000	1.85
San Jose	1,030,359	715,755	714,200	1.00
Indianapolis	94,4139	232,939	123,500	1.89
Austin	939,768	332,302	285,900	1.16
Jacksonville	925,996	297,756	150,200	1.98
San Francisco	872,795	730,743	927,400	0.79
Columbus	866,918	170,279	136,500	1.25

* New York has a city income tax that is not included in the analysis. This may overstate the break-even price.

Table 6 shows that the median home price is lower than the financial break-even price in Los Angeles, San Diego, and San Francisco. However, these cities already have high median home prices and, consequently, cannot provide homes at *affordable rates* while remaining fiscally

sound. For the rest of the cities, median homes also do not break even, and therefore, new homes have to be more expensive than existing (median) homes for the city to break even fiscally. For example, in 2017, Houston's homes had to be more than twice the price of median homes for the city to break even.

Trends in break-even price

For U.S. cities, break-even prices are trending against affordable homes. Table 7 tracks the trend in the price ratio between break-even prices and median home value over the years. The data is only available yearly from 2010-2017 and for 2000 when the census was carried out.

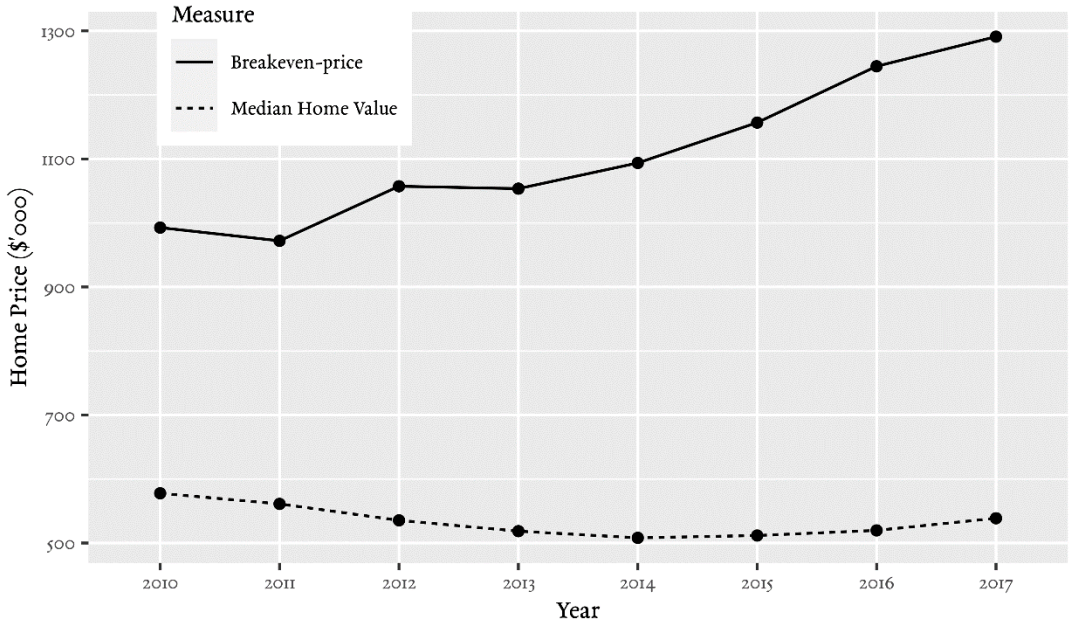
Table 7. The Price-ratio of homes in top U.S. cities over the years.

Year	Mean *Price-ratio* of U.S. cities*
2000	1.70
…	
2010	1.79
2011	1.74
2012	1.71
2013	1.73
2014	1.73
2015	1.81
2016	1.82
2017	1.84

* Cities tracked by the Lincoln Institute

Between 2010 and 2017, U.S. cities' price ratio (break-even price to median home value) increased. Consequently, homes had to be more expensive every year to be fiscally break-even for the city. This is even though median home prices rose during this period. The increase in *price-ratio*, therefore, understates the home price increase needed to keep a new home fiscally neutral in a U.S. city. For example, New York saw an increase in the divergence between the median home value and the fiscal *break-even price*, between 2010 and 2017 (figure 27).

Figure 27. New York's median home value and *break-even price*.



During this period, New York's median home value *decreased* marginally from $578K to $539K, but the city's *break-even price increased* from $993K to $1.2 million. Most U.S. cities (tracked) saw similar increases in their *break-even price.*

This increase in break-even price may explain why cities *increase* zoning restrictions over time. While a $993K home (not considered affordable) would have been *break-even* for the city in

2010, the same home could not be approved in 2017. New York had to eliminate all new development below $1.2 million in 2017.

What is Driving the Increase in Break-even Prices

What explains the increase in *break-even price* over time? Why do cities need more and more expensive homes to break even fiscally? There are two approaches to explaining the phenomenon observed: (i) the theoretical framework of public choice and (ii) the observed outcome in city finances, especially in the funding of education. Both these approaches seem to coincide, but this paper cannot eliminate other explanations. Therefore, this paper is merely proposing an explanation and not establishing it.

Theoretical framework

The theoretical framework that explains the increase in the *break-even price* of homes is *public choice theory* as applied to fiscal consideration. This theory has been pointed out in the case of non-profits.[222] According to Glaeser and Shleifer, non-profits have lower incentives to cut costs because they cannot distribute the savings to their investors. Therefore, non-profits may increase quality (or expenditure on the product). Similarly, city governments do not profit from reducing costs. In fact, public choice theory predicts the exact opposite—government departments consistently try to maximize their budget. Moreover, most city government bureaucracies spend

[222] Glaeser and Shleifer, "Not-for-Profit Entrepreneurs."

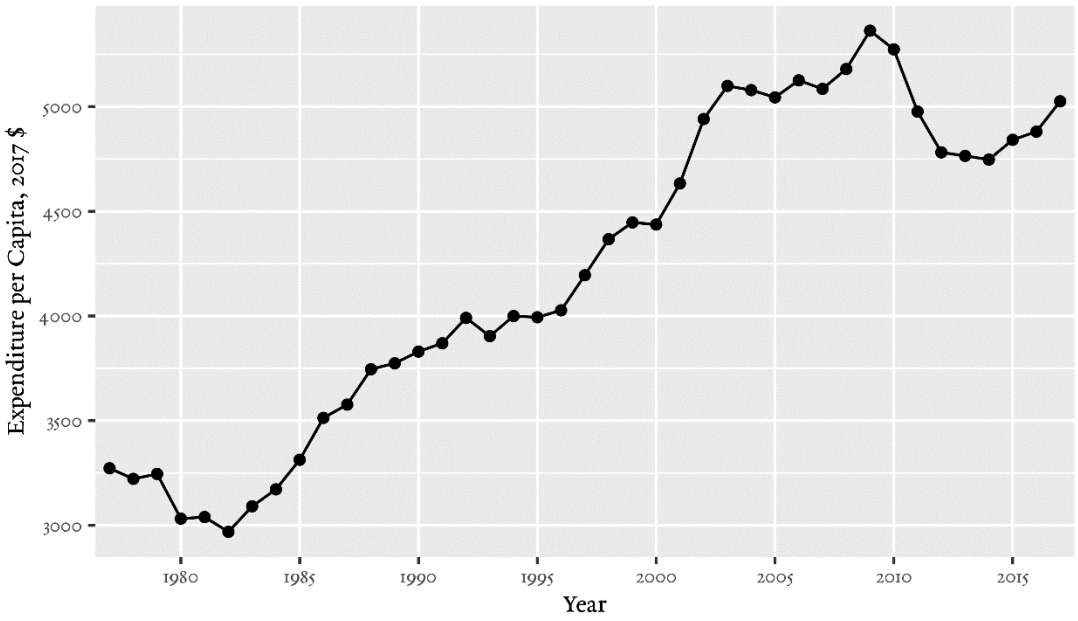
a percentage of the budget on administrative expenses. These expenses fund the functionaries of a city government, the very set of people responsible for forming the budget and setting tax rates. Therefore, the higher the total budget of a city is, the larger (absolute) the administrative expense of the city.

In this theoretical model, city governments increase spending to match the total revenue generated from the city instead of finding the optimum level of spending and then collecting that amount as revenue. Hypothetically, in the initial period, the city has an average value of real estate. The city government expands its spending so that it matches the average value of real estate. The city government has no incentive to reduce spending through efficiencies. This is because the city officials cannot keep any surplus from such efficiency gains. At this point, any new real estate faces resistance from the government and existing citizens if it is below the existing average value. The city government resists the development because the revenue increase will not offset the increase in expenditure. Similarly, the existing citizens do not want to approve any (below average value) development because such development will have to be cross-subsidized by the existing residents.

Observation: School Financing

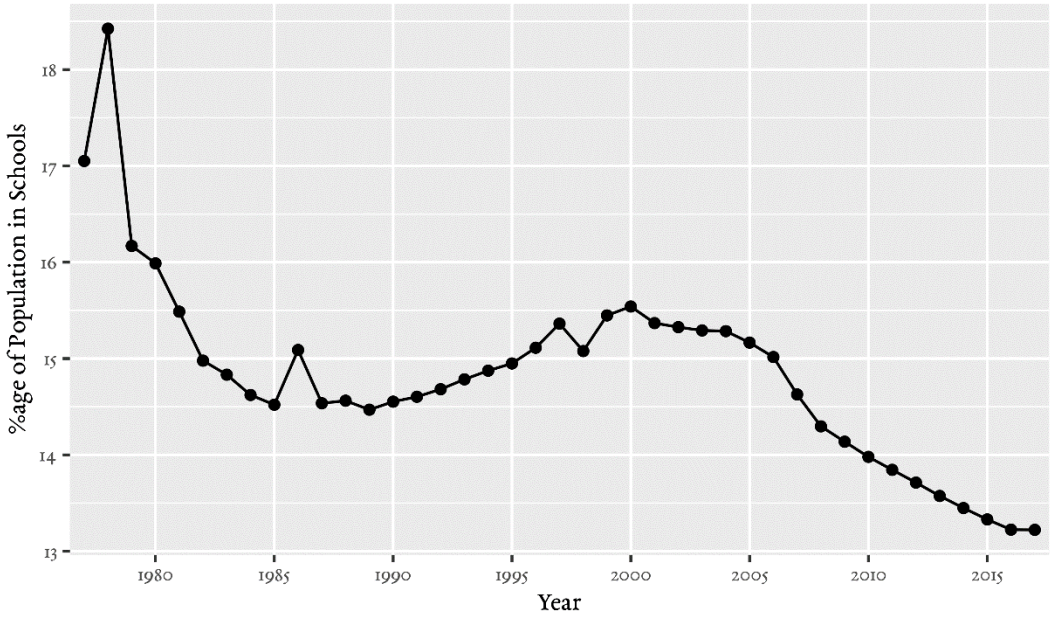
This theoretical model is observed in fiscal data collected by the Lincoln Institute. Since 1977, city services have only increased in cost (figure 28), except for the few years after the 2008 crash.

Figure 28. Median Spending per Capita in U.S. Cities.



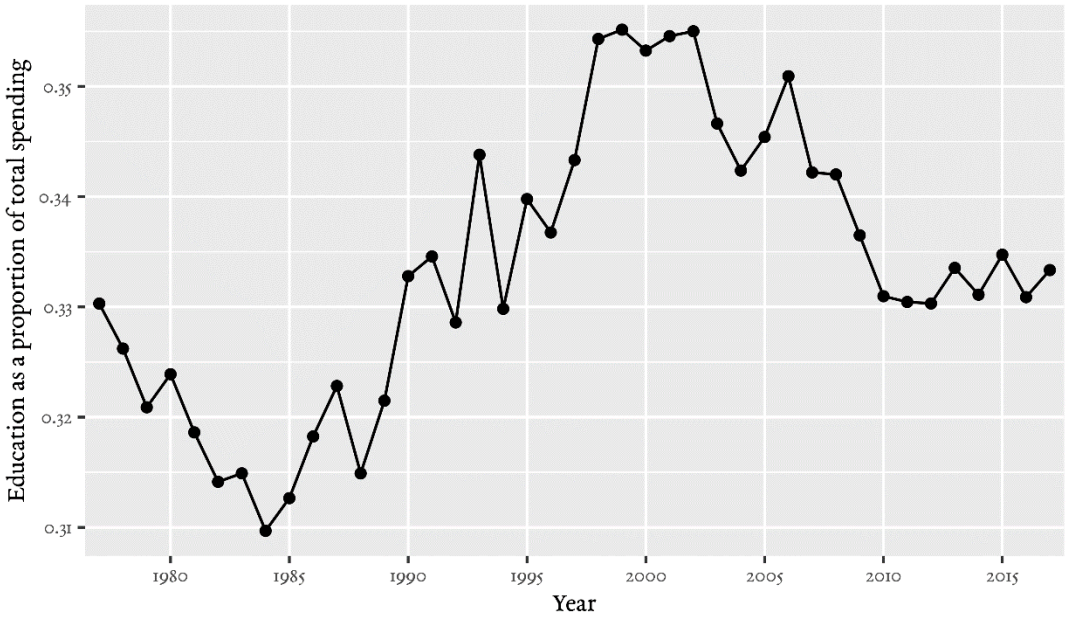
This increase in spending is across all the components of city services. However, one component of city expenditure stands out in the level of its increase—school expenditure. This expenditure is an outlier when the demographic change in the U.S. is considered. In the U.S.'s largest cities, the percentage of population in school has fallen significantly (figure 29) from around 17% to less than 14%.

Figure 29. Percentage of city population in school over the years.



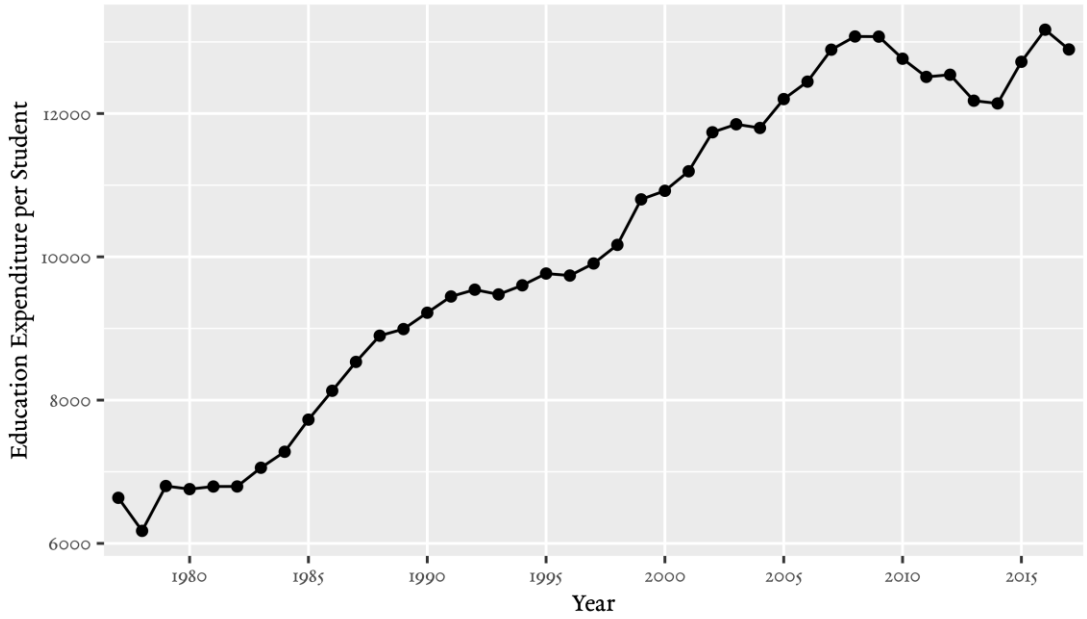
One would, therefore, expect that education expenditure as a share of total expenditure should also fall for cities. But this has not happened (figure 30) and the expenditure on education has stayed constant at ~33% of the city government's expenditure.

Figure 30. Median education expenditure as a proportion of total city expenditure.



This anomaly was achieved by dramatically increasing the expenditure per student in publicly funded schools (figure 31).

Figure 31. The increase in education expenditure per student (inflation adjusted).



Though school enrollment fell in U.S. cities, this increase in spending makes U.S. cities especially sensitive to population increases, especially if such population increases involve an increase in school-going children. This is because, unlike other expenditures, school expenditures in U.S. cities are usually governed by two restrictions: (i) the fixing of the teacher-student ratio in law and (ii) the requirement to fund around a third of school expenditures from property taxes.

Many state laws mandate that schools must cap the student-to-teacher ratio. This restriction requires city schools to expand schooling expenditure if the number of schoolchildren in a city increases. The city (school district) cannot increase the number of students in a class and save costs. Most states track spending-per-student as a metric and require public schools to maintain this expenditure at a level. Similarly, property taxes significantly fund school expenditures in the U.S. States and the federal government do fund a part, but around a third is funded from property

taxes collected by the cities (on behalf of the school districts). This means that any increase in school students will lead to a substantial increase in property taxes or an increase in the value of the property per capita in the city.

A New Explanation

The existing literature on NIMBYism and unaffordable housing has concentrated on the action of the *homevoter,* i.e. the existing residents. These economic models propose that the residents vote their preferences into the government, and the government acts as a *perfect agent* of the *homevoter*. However, these models have ignored the fact that the government is rarely a *perfect agent.* Public choice theory predicts that the government suffers from the *principle-agent problem,* i.e., the government has its objectives that may be orthogonal or even opposite to the interest of the residents.

The analysis above indicates that NIMBYism and restrictive zoning are a product of the interaction of government interests with the interests of the existing residents.[223] The existing residents of a city may not be resistant to affordable housing if such housing does not increase their tax burdens. This should have been possible because of the general effects of economies of

[223] The government can ignore the interests of the proposed residents because they do not vote in the city elections till their homes are approved.

scale. Government services *should* have high fixed costs and low marginal costs. However, this option is removed from the table due to the government's self-interest in maximizing the budget, usually by revenue maximization. Therefore, at any given period, the government collects the maximum taxes that the citizens are willing to give instead of the appropriate amount needed to provide government services. Since governments cannot retain this amount, it is usually spent.

This government over-spending creates a problem for prospective residents. Adding new residents means the government must provide them the same services as existing residents. However, this is possible only if the new residents generate the same average revenue as the existing residents. Any lower taxes would require the older residents to cross-subsidize the newer residents. Therefore, the new housing has to be more expensive than existing housing.

There may be a situation where the existing citizens may prefer affordable housing in the city even if they are richer and do not wish to consume such housing. Affordable housing would bring cheaper labor to the city and contribute to economic growth. Businesses of existing citizens could benefit from higher population density. Labor at different prices also acts as complementary inputs that lead to economic growth. An office cannot be purely staffed by managers or be solely staffed by workers. The complementary inputs of different labor prices may produce benefits for both the existing and new citizens. Therefore, a rational *homevoter* should consider new affordable housing as a cost-benefit analysis and appropriately instruct their government. The existing *homevoter* could prefer a policy where the government expenditure per capita is reduced in return for benefiting from the city's population increase, especially with persons willing to work at lower wages. Such a deal would be possible under Tiebout's model. There is no need for existing voters to be locked in their initial preference for government

services. Such a trade may also *increase* the value of the home of the existing voter due to the same complementarity and, therefore, be profitable in terms of Fischel's theory.

However, this transaction is not in the interest of the government. Reducing per capita expenditure would mean the government would have to collect less taxes. This may reduce the size of the government budget or force the government to innovate to cut costs. Public choice theory predicts that the government will not prefer these outcomes, even if the existing voters would like them. Therefore, the existing voter is left with two choices: (i) agree to cross-subsidize the new affordable housing, or (ii) join with the government to pass restrictive zoning laws (NIMBYism). The second option may be sub-optimal but may be superior to being forced to cross-subsidize the residents of the new affordable housing.

The city government may also *unwillingly* act against the interest of affordable housing, mainly through the laws governing school education set at the federal and state levels. Many laws target a specific level of spending per child. The city government may be open to reducing expenses in education through economies of scale by implementing strategies like fewer schools or larger class sizes. However, laws and collective bargaining agreements may prevent the city government from implementing cost-cutting measures. For example, the City of Chicago cannot open new charter schools under the 2019 bargaining agreement with the Chicago Teachers'

Union. Charter schools usually receive less funding than their public counterparts with similar or better outcomes.[224]

Added explanation for Gentrification

An added advantage of the model in this paper is that it also explains another phenomenon that has attracted the attention of academics and policymakers— the resistance to Gentrification. Gentrification is the process by which affordable, high-density housing in low-income areas of a city is demolished to make homes that may be considered unaffordable (and low-density) for the existing neighbors. The resistance of existing residents to gentrification has been recorded in academic literature, albeit not as much as NIMBYism. Like NIMBYism, the existing literature on gentrification provides multiple explanations for resistance to gentrification, like loss of identity, being priced out, etc.

However, the fiscal analysis of homes may provide a better understanding of the resistance to gentrification. Gentrification is a double bonanza to the fiscal scenario of a city. It increases the revenues of the city, through higher property values. And, at the same time, it decreases the expenditures of the city with lower population density. Therefore, the city governments would prefer gentrification.

[224] Johnson et al., "Still a Good Investment."

For the neighbors of a gentrified area, the outcomes should also be in their favor as their home values increase by being near gentrified buildings. However, fiscally, the situation is not positive for existing neighbors. The existing citizens know that the city will expand its expenditure to meet its increased revenue. This will negatively affect the existing affordable and high-density housing revenue for the city. Consequently, the city will try to demolish existing housing that is affordable and high-density to replace it with low-density, *unaffordable* housing.

This paper's model also explains why resistance to affordable housing is *more* successful than resistance to gentrification. In the case of affordable housing, the city government and existing citizens can come to an alignment of interests— exclusionary zoning. While this may not be globally optimum, it is an optimum solution in the face of the interests of the city government and existing residents. On the other hand, in the case of gentrification, the city government's interest (driven by public choice) is completely opposite to that of the existing residents. This may explain why resistance to gentrification almost always fails, but resistance to affordable housing succeeds frequently.

Implications

The explanation proposed in this paper has implications for public policy. As long as the city keeps increasing expenditure per capita, there will be resistance to creating affordable housing in a city because affordable housing may be fiscally *unaffordable*. There have been many attempts at increasing the availability of housing in cities. Most of them involve awareness campaigns and campaigns to change zoning restrictions. Some cities are even attempting to reduce the area

under single-family zoning.[225] However, the model in this paper predicts that awareness campaigns may not work in the long term. This is because voters are asked to make decisions against their economic interests. Some decisions may be taken to appear to meet the campaign demands, but the city government and voters will work through other mechanisms to fight the growth of affordable housing. This is already being seen in California. In 2021, California passed a state amendment to abolish single-family home zones and turn them into minimum four-unit zones.[226] However, the law did not create the expected outcome. Research has noted that the law did not lead to any significant increase in multi-dwelling housing. A city as large as Los Angeles saw just 211 applications for multi-family homes in 2021 as opposed to 20,000 single-family home permits.[227]

Conclusion

Housing is becoming more unaffordable in the U.S. and is being driven by exclusionary zoning that discourages high-density, affordable housing. There have been multiple attempts to solve the problem. However, they seem to be failing. Even when laws are changed, like upzoning single-family areas to multiple-unit dwellings. The reason for this failure is probably driven by the lack

[225] Badger and June, "Cities Start to Question an American Ideal: A House With a Yard on Every Lot."
[226] SB-9 Housing development: approvals.
[227] Garcia and Alameldin, "California's HOME Act Turns One."

of understanding of what drives NIMBYism and exclusionary zoning. Existing models have not been adequate in providing an explanation for what is happening in the real world of U.S. cities.

This paper proposes a new model that improves on the existing economic models of city finances and zoning. It does so by modeling city governments as entities different from the residents of the city. The incentives of the city government are not the same as that of the citizens. This lesson from public choice has not been incorporated into the analysis of cities.

The results of this analysis may be disheartening because it predicts that the current approaches to solving the housing affordability problem will not be successful or sustainable. However, on a positive note, the paper is an attempt at better understanding the root cause of the problem. Future policymakers may find this paper useful in crafting policies that permanently solve the problem of unaffordable housing.

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