

# Industrial Policy for Networks of Firms

Dave Donaldson, MIT

# What I will talk about today

1. What is industrial policy (IP)?
2. When does IP work (in theory)?
3. The importance (and unimportance) of firm networks for good IP
4. When does IP work (in practice)?
5. How well could we expect IP to perform?

# What I will talk about today

1. What is industrial policy (IP)?
2. When does IP work (in theory)?
3. The importance (and unimportance) of firm networks for good IP
4. When does IP work (in practice)?
5. How well could we expect IP to perform?

# What is industrial policy?

- Deliberate policy attempt to **shape composition** of economy
  - E.g. firms, sectors (not just “industrial”), regions
- By **moving scarce resources (capital/labor)** around
  - E.g. workers used in coal mine vs. in car factory
  - E.g. human capital used in R&D vs. production
  - E.g. R&D today vs. R&D tomorrow
- **Why bother?**
  - Raise aggregate economic productivity – better use of total resources
  - Plus: redistribution/political economy

# What I will talk about today

1. What is industrial policy (IP)?
2. When does IP work (in theory)?
3. The importance (and unimportance) of firm networks for good IP
4. When does IP work (in practice)?
5. How well could we expect IP to perform?



And so, having made my plea, let me salute the profession with what might well have been the title of this paper, with what is certainly the key that points to the solution of most problems in applied welfare economics, with what surely should be the motto of any society that we applied welfare economists might form, and what probably, if only we could learn to pronounce it, should be our password:

$$\text{“ } \int_{z=0}^{z^*} \sum_i D_i(z) \frac{\partial X_i}{\partial z} dz. \text{”}$$

Arnold Harberger (1971)

## Key definition

A large, empty rounded rectangular box with a red border, intended for a key definition.

## Key definition

$$\text{VMPL}_1 = \text{Value-adjusted marginal product of labor when producing "good 1"} = \text{How much more of good 1 would be produced if given a bit more labor to use} \times \text{"Price" of good 1}$$

## Key definition

$$\text{VMPL}_1 = \text{Value-adjusted marginal product of labor when producing "good 1"} = \boxed{\text{How much more of good 1 would be produced if given a bit more labor to use}} \times \boxed{\text{"Price" of good 1}}$$

## Key result

## Key definition

$$\text{VMPL}_1 = \text{Value-adjusted marginal product of labor when producing "good 1"} = \boxed{\text{How much more of good 1 would be produced if given a bit more labor to use}} \times \boxed{\text{"Price" of good 1}}$$

## Key result

$$\text{Aggregate productivity gain from industrial policy} \cong \boxed{\text{VMPL}_2 - \text{VMPL}_1} \times \boxed{\text{How much the policy moved labor from good 1 to good 2}}$$

## Key definition

$$\text{VMPL}_1 = \text{Value-adjusted marginal product of labor when producing "good 1"} = \left[ \text{How much more of good 1 would be produced if given a bit more labor to use} \right] \times \left[ \text{"Price" of good 1} \right]$$

## Key result

$$\text{Aggregate productivity gain from industrial policy} = \text{VMP} \int_{z=0}^z \sum_i D_i(z) \frac{\partial X_i}{\partial z} dz.$$

**Why might we expect  $VMPL_2 > VMPL_1$  ?**

Why might we NOT expect  $VMPL_2 > VMPL_1$  ?

# Why might we NOT expect $VMPL_2 > VMPL_1$ ?

- Bedrock of modern economics (Smith, Ricardo, Arrow, Debreu, Friedman, Mas-Colell...) built on belief that "market failures" are rare
- Boskin (White House, 1992): "It doesn't make any difference whether a country makes computer chips or potato chips. \$100 of one, or \$100 of the other; it's still \$100."
- In this view, "best industrial policy is none at all" (Becker) because:

$$\text{Gain} = (VMPL_2 - VMPL_1) \times (\text{Labor moved}) = 0$$

**Why might we expect  $VMPL_2 > VMPL_1$  ?**

# Why might we expect $VMPL_2 > VMPL_1$ ?

- **Knowledge spillovers**
  - Production in good 2 teaches useful (yet uncompensated) things to good 1
- **Public goods**
  - Good 2 enhances national security more than good 1 does
- **Credit market frictions**
  - Useful ideas for making good 2 go under-funded more than for good 1
- **Market power**
  - Good 2 less competitive (higher markups) than good 1

# Top 6 NOT market failures (per se)

1. The many ways that firms affect one another via prices
2. Input-output networks
3. Firm-level increasing returns to scale, learning-by-doing
4. "Coordination failures"
5. Lack of investment, innovation, technology adoption, upgrading
6. International price and/or profit-shifting

# How to optimize industrial policy?

$$\text{Gain} = (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved})$$

- How to maximize these gains?
- Subsidize labor to move from good 1 to good 2
- But how much of a subsidy?

# How to optimize industrial policy?

$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved})$$

- How to maximize these gains?
- Subsidize labor to move from good 1 to good 2
- But how much of a subsidy?



Arthur Pigou (1920):  
*The Economics of Welfare*

$$\% \text{ Subsidy for labor in 2} = (\text{VMPL}_2 - \text{VMPL}_1)$$

# What I will talk about today

1. What is industrial policy (IP)?
2. When does IP work (in theory)?
3. The importance (and unimportance) of firm networks for good IP
4. When does IP work (in practice)?
5. How well could we expect IP to perform?

# What does this have to do with networks?

Gain  $\cong$   $(VMPL_2 - VMPL_1) \times (\text{Labor moved from 1 to 2})$

% Subsidy for Labor in 2 =  $(VMPL_2 - VMPL_1)$

# What does this have to do with networks?

$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved from 1 to 2})$$

$$\% \text{ Subsidy for Labor in 2} = (\text{VMPL}_2 - \text{VMPL}_1)$$

- Buyer-seller links may be a conduit for market failures like knowledge flows
  - E.g. Alfaro-Urena et al (2023)
- Careful though: flows need to be uncompensated to be a market failure

# What does this have to do with networks?

$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved from 1 to 2})$$

$$\% \text{ Subsidy for Labor in 2} = (\text{VMPL}_2 - \text{VMPL}_1)$$

- Buyer-seller links may be a conduit for market failures like knowledge flows
  - E.g. Alfaro-Urena et al (2023)
- Careful though: flows need to be uncompensated to be a market failure

- Optimal industrial policy subsidy has nothing (per se) to do with networks
  - Liu (2019) is not about optimum
- But gains from good industrial policy very much can be

# What I will talk about today

1. What is industrial policy (IP)?
2. When does IP work (in theory)?
3. The importance (and unimportance) of firm networks for good IP
4. When does IP work (in practice)?
5. How well could we expect IP to perform?

# 3 conditions for IP to work in practice

$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved from 1 to 2})$$

# 3 conditions for IP to work in practice

$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved from 1 to 2})$$

- Condition 1: must know which goods have the relatively high VMPLs
- Most economists would acknowledge that real economies feature many market failures. But I suspect they wouldn't agree on where the market failures are most problematic.
- Most empirical work (on market failures or measuring VMPL) focuses on the average VMPL not its heterogeneity

# 3 conditions for IP to work in practice

$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved from 1 to 2})$$

- Condition 2: get labor to move with feasible policy tools (subsidies, etc.)
- Massive concern with subsidizing things is "additionality": does the subsidy actually get firms to change behavior?
- E.g. Criscuolo et al (2019): big UK firms didn't respond to IP
- E.g. Chen et al (2021): Chinese firms' R&D is 28% "relabeling" (tax cut)
- But Lane (2025): Enormous investment response to subsidies in S. Korea
- Liu (2019): Upstream activities in network generate knock-on effect
- Bartelme et al (2025): tradable goods allow escape from demand constraints

# 3 conditions for IP to work in practice

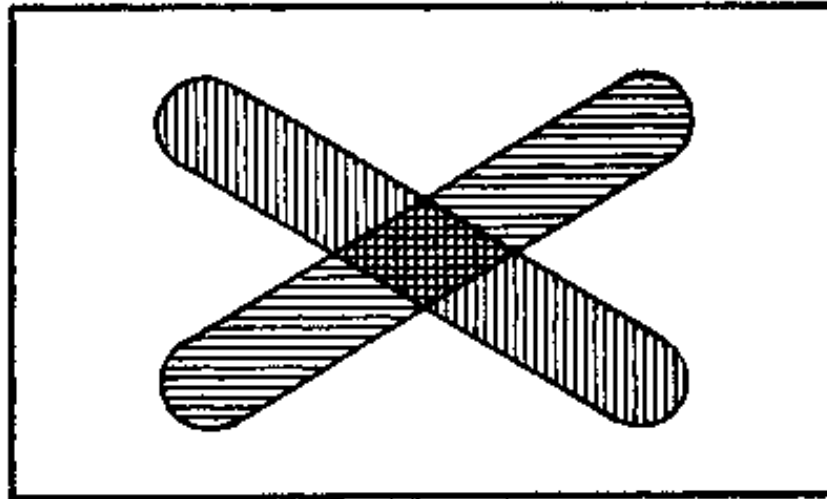
$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved from 1 to 2})$$

- Condition 3: target subsidies at the high VMPL sectors

- This is hard to do. Standard "government failures" concerns.
- No study (to my knowledge) about whether this happens or not with real industrial policy

# 3 conditions for IP to work in practice

$$\text{Gain} \cong (\text{VMPL}_2 - \text{VMPL}_1) \times (\text{Labor moved from 1 to 2})$$



SET OF ALL ACTIVITIES



Subset with significant  $D_1$



Subset with significant  $\Delta X_1$



Intersection of the two subsets

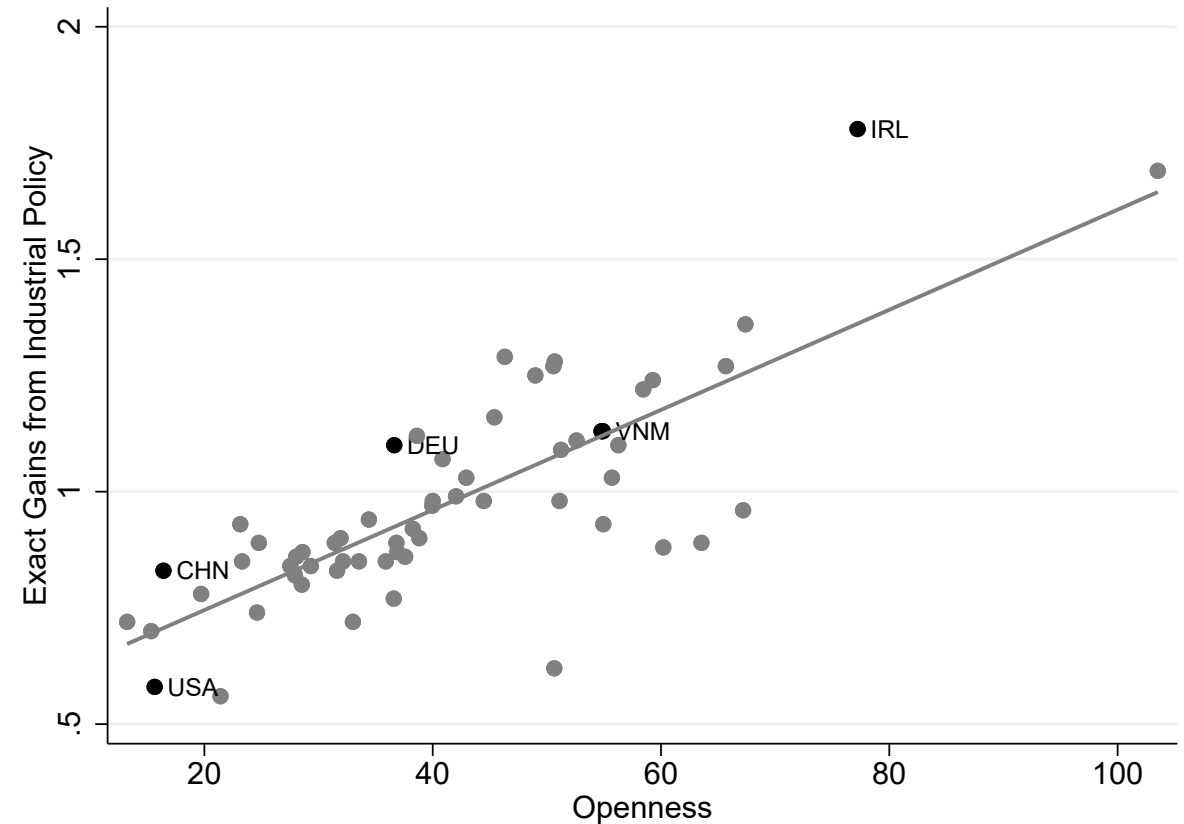
Arnold Harberger (1971)

# What I will talk about today

1. What is industrial policy (IP)?
2. When does IP work (in theory)?
3. The importance (and unimportance) of firm networks for good IP
4. When does IP work (in practice)?
5. How well could we expect IP to perform?

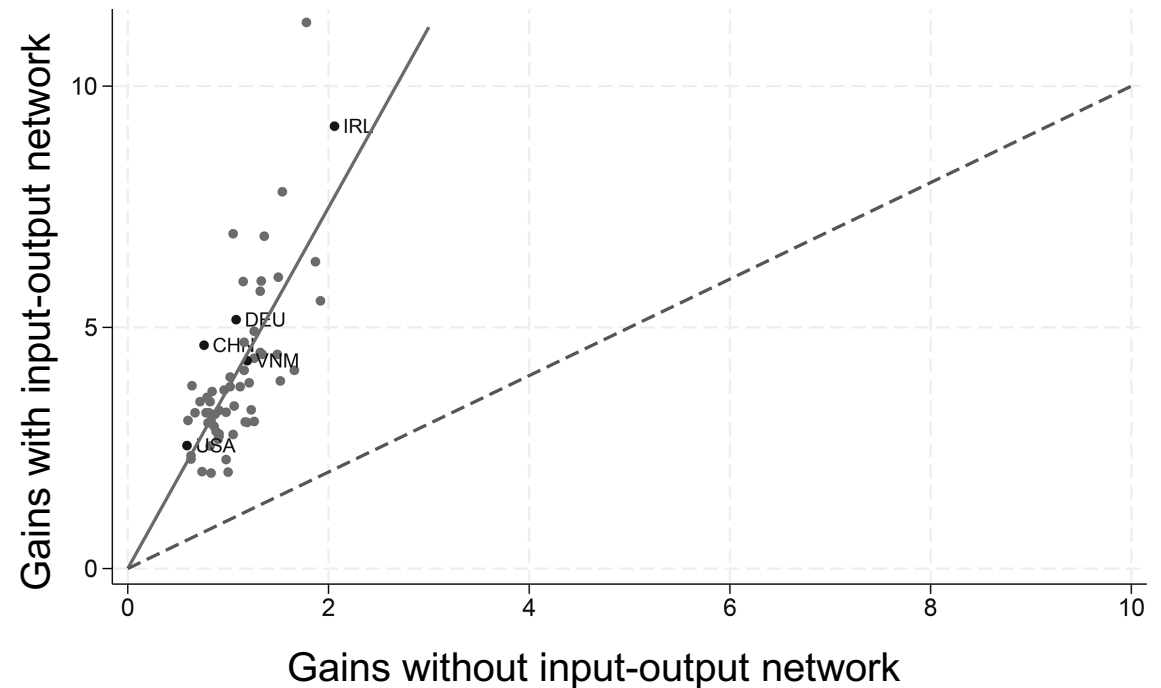
# How good could optimal industrial policy be?

- Bartelme et al (2025):
  - Estimate long-run, sector-specific production externalities for 61 countries
  - Elasticities range from 0-0.31
  - Then solve for effect of unilaterally-optimal industrial policy for each country
  - Idealized scenario, yet gains are small (one-off gain of 1% GDP on average)



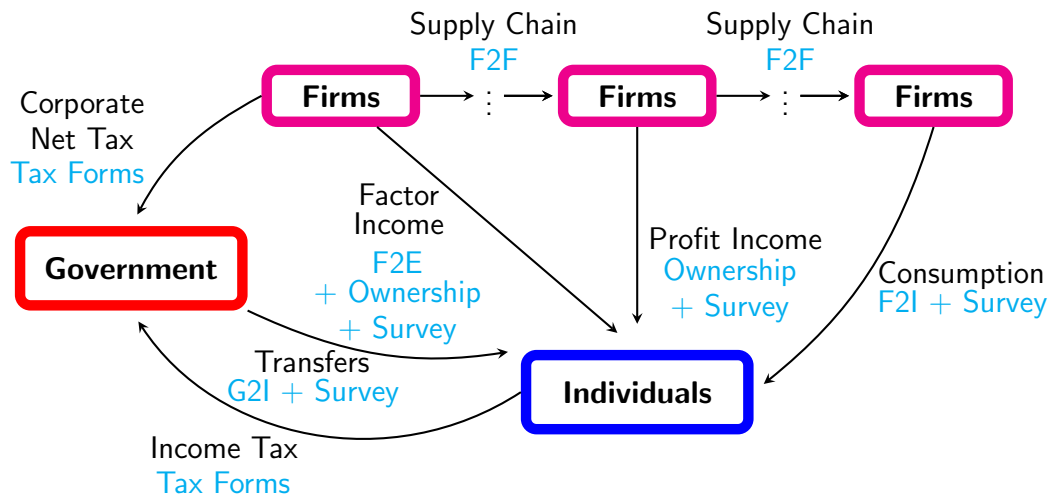
# How good could optimal industrial policy be?

- Bartelme et al (2025):
  - Gains get 4x bigger if add input-output network to match data
  - But this is mostly just because now the externality is assumed to work via gross output (GO) instead of value-added (VA), and  $GO \gg VA$

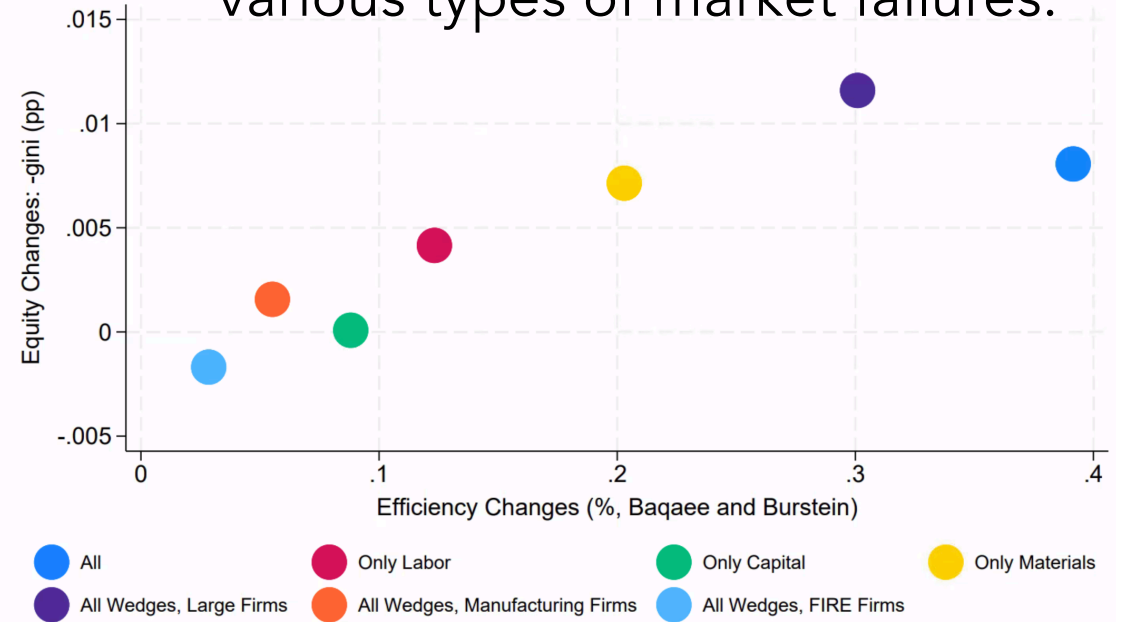


# Is there an equity-efficiency trade-off?

- Atkin et al (2026):
  - Chile, 2022
  - Tax data on all F2F and F2C transactions
  - And all ownership, employment, tax, transfer links



Simulated effects of shrinking various types of market failures:



# Summary and next steps

- **Implementing successful industrial policy is incredibly hard**
  - Where are the market failures relatively bad?
  - How can we subsidize movement of resources towards such areas without creating so much leakage that it isn't worth it?
  - And how to avoid adverse distributional/political consequences?
- **Researchers can do more to help!**
  - Measure VMPL heterogeneity (methods developed in Carrillo et al, 2023)
  - Measure the additionality of various real-world policy instruments
  - Estimate and validate models of aggregate gains (to compare to leakage)
- **New era of firm network data will greatly enhance this agenda**